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Eiffert et al.

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(54) **METHOD AND SYSTEM FOR MONITORING AND TREATING A PATIENT**

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(52) U.S. Cl. .... **600/300; 128/920; 705/2**

(58) Field of Search ..... **600/300, 301; 128/920-923; 705/2, 3**

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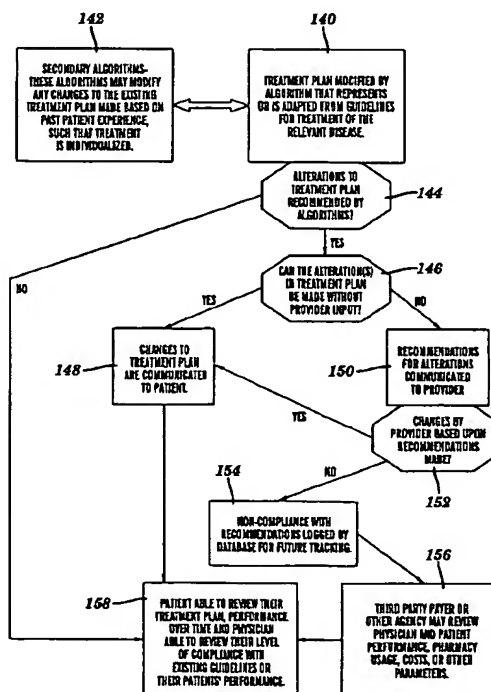
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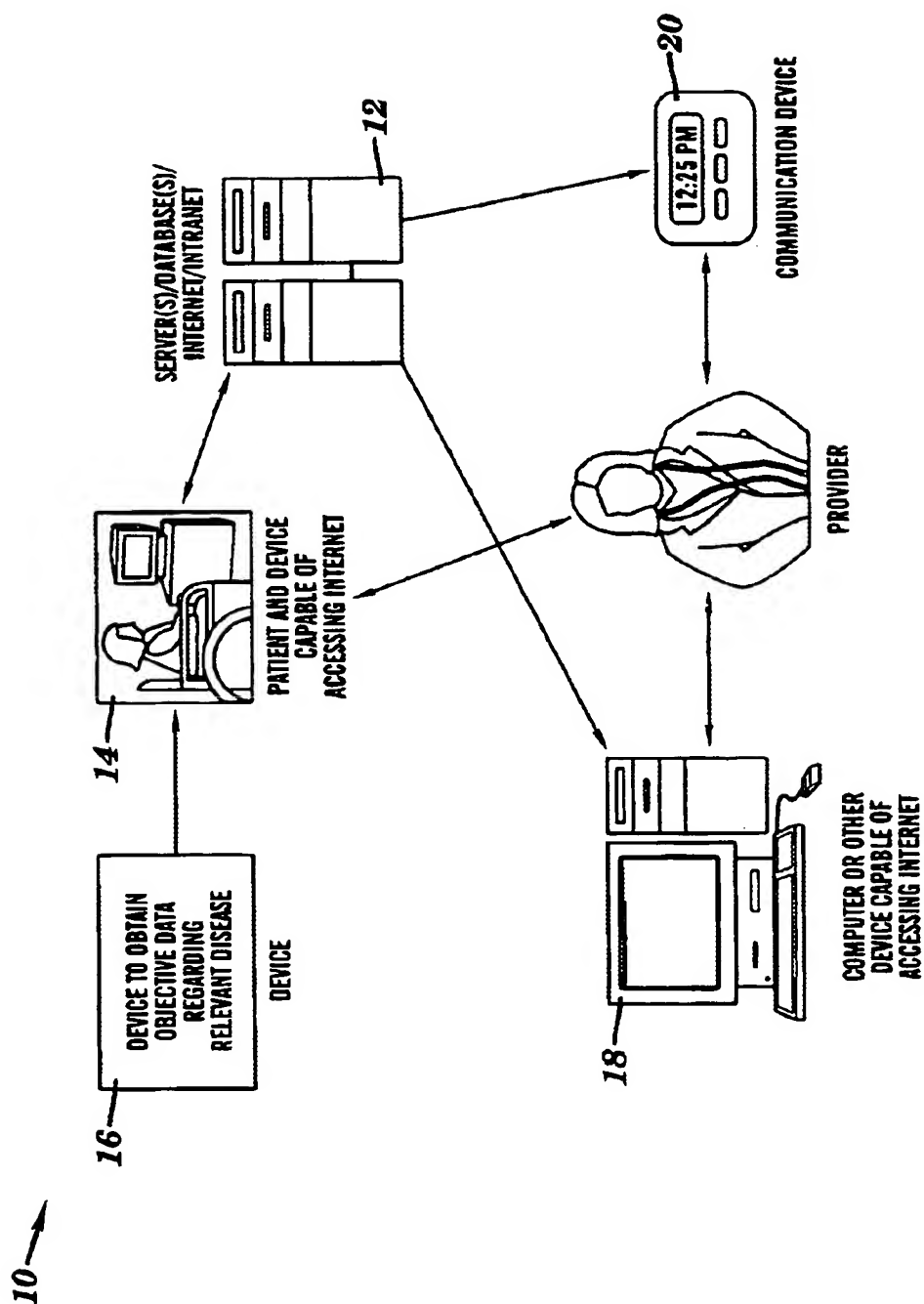
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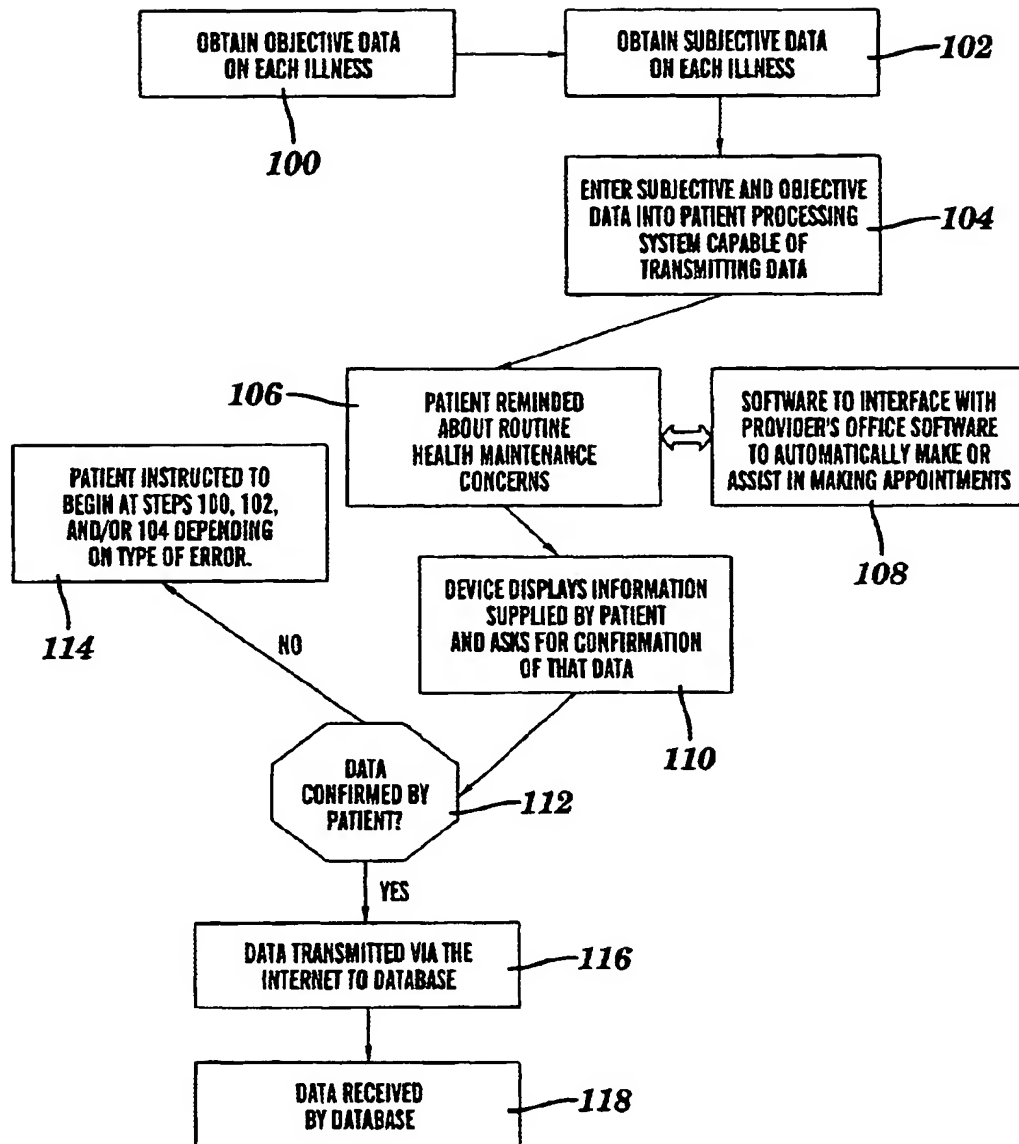
#### ABSTRACT

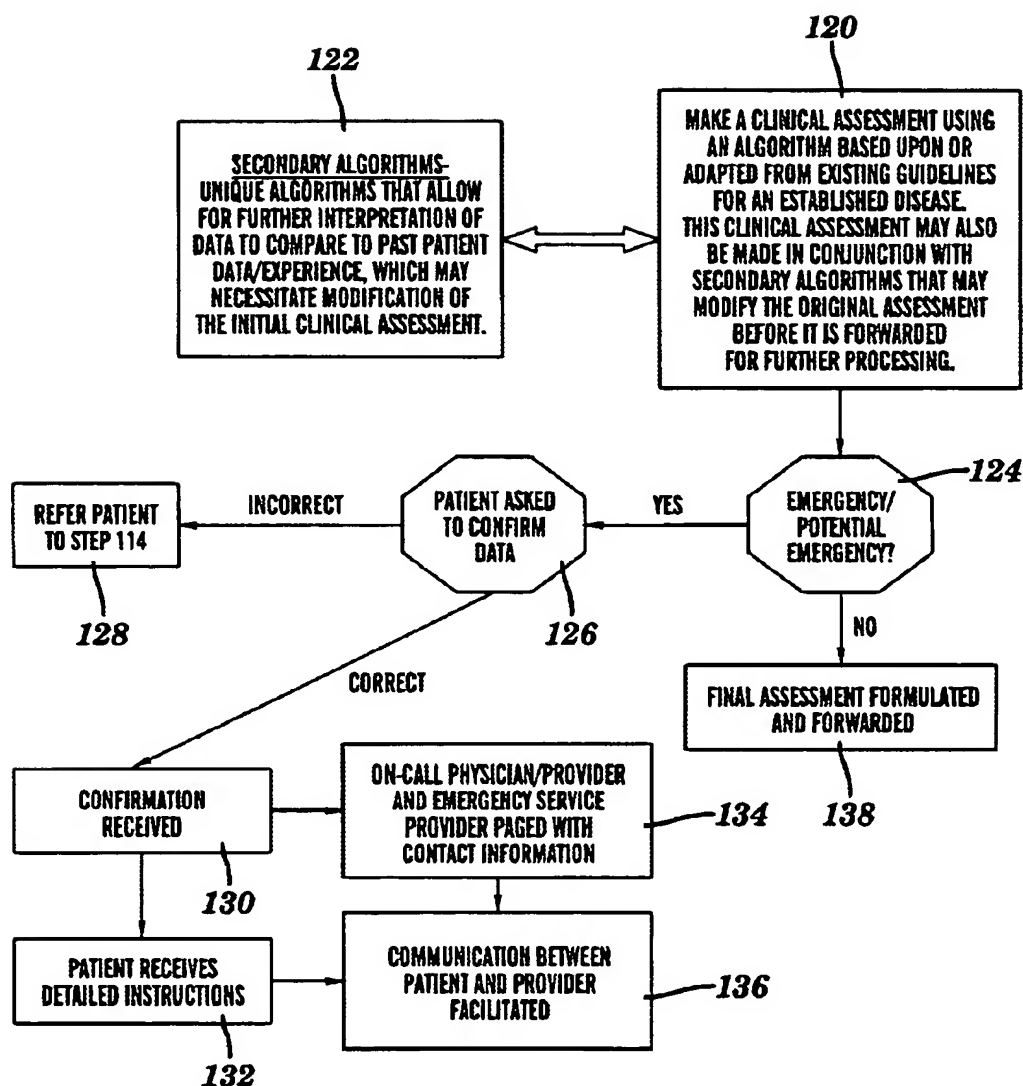
A method for monitoring and treating a patient with one or more diagnosed conditions includes a few steps. A current assessment of each of the diagnosed conditions is determined in a treatment processing system. The current assessment is based on objective data and subjective data about each of the diagnosed conditions from the patient who is at a remote location and on one or more assessment guidelines for each of the diagnosed conditions. Next, an existing treatment plan for each of the diagnosed conditions is updated using the treatment processing system. The updated treatment plan is based on the existing treatment plan, the current assessment and on one or more treatment guidelines for each of the diagnosed conditions. The updated treatment plan for each of the diagnosed conditions is then transmitted to the patient for application by the patient at the remote location.

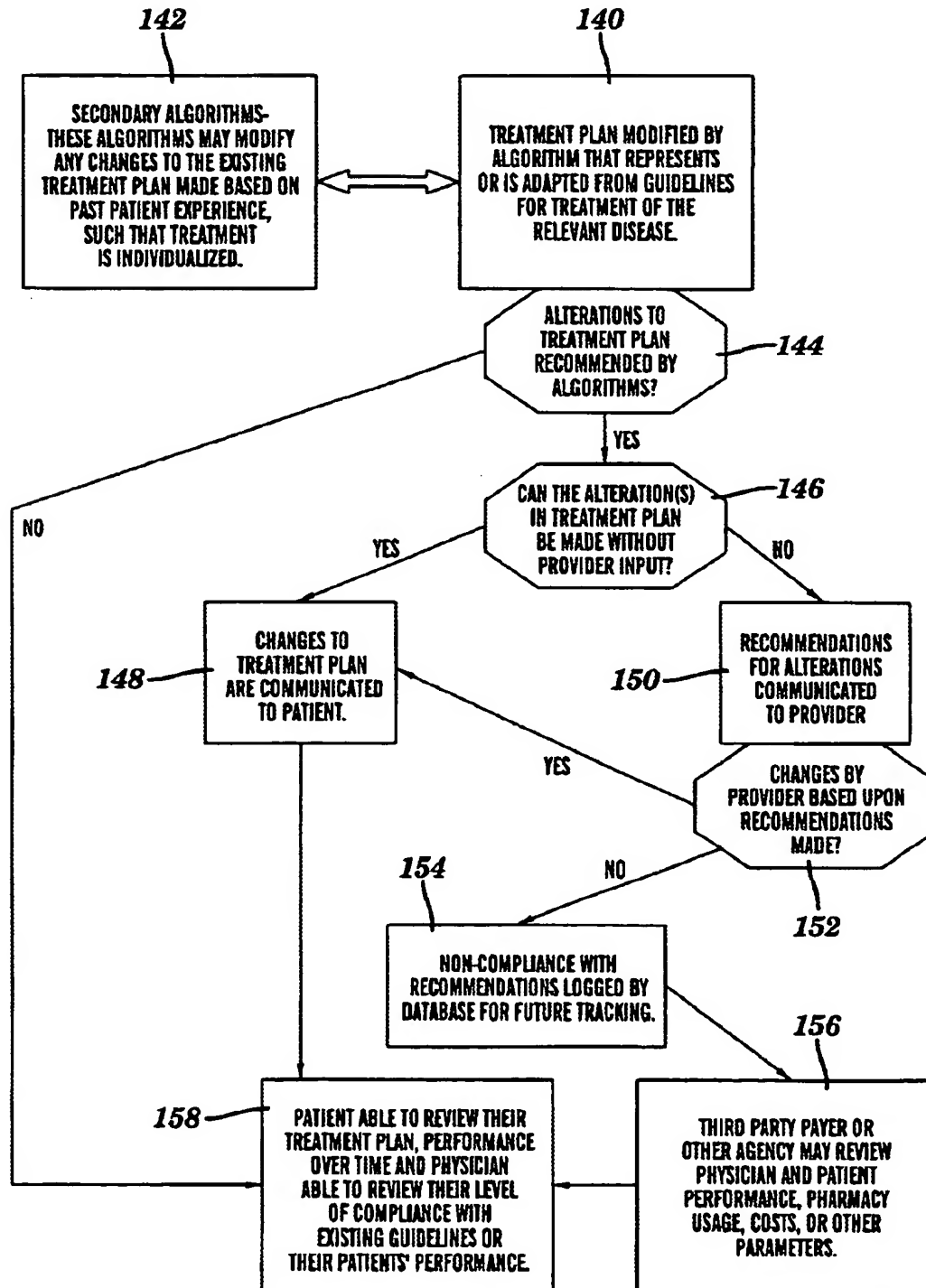
9 Claims, 16 Drawing Sheets

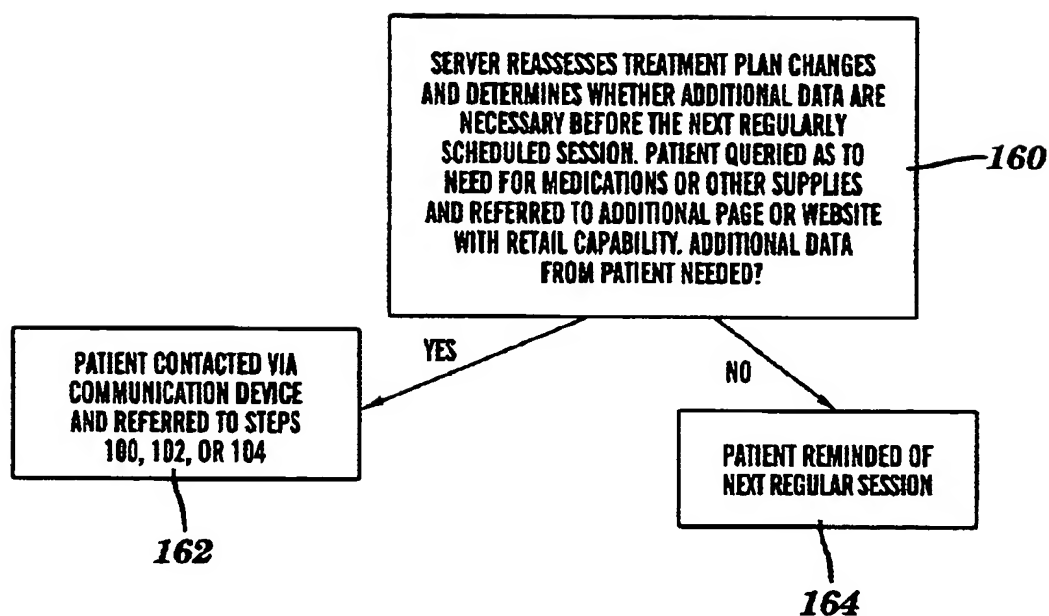


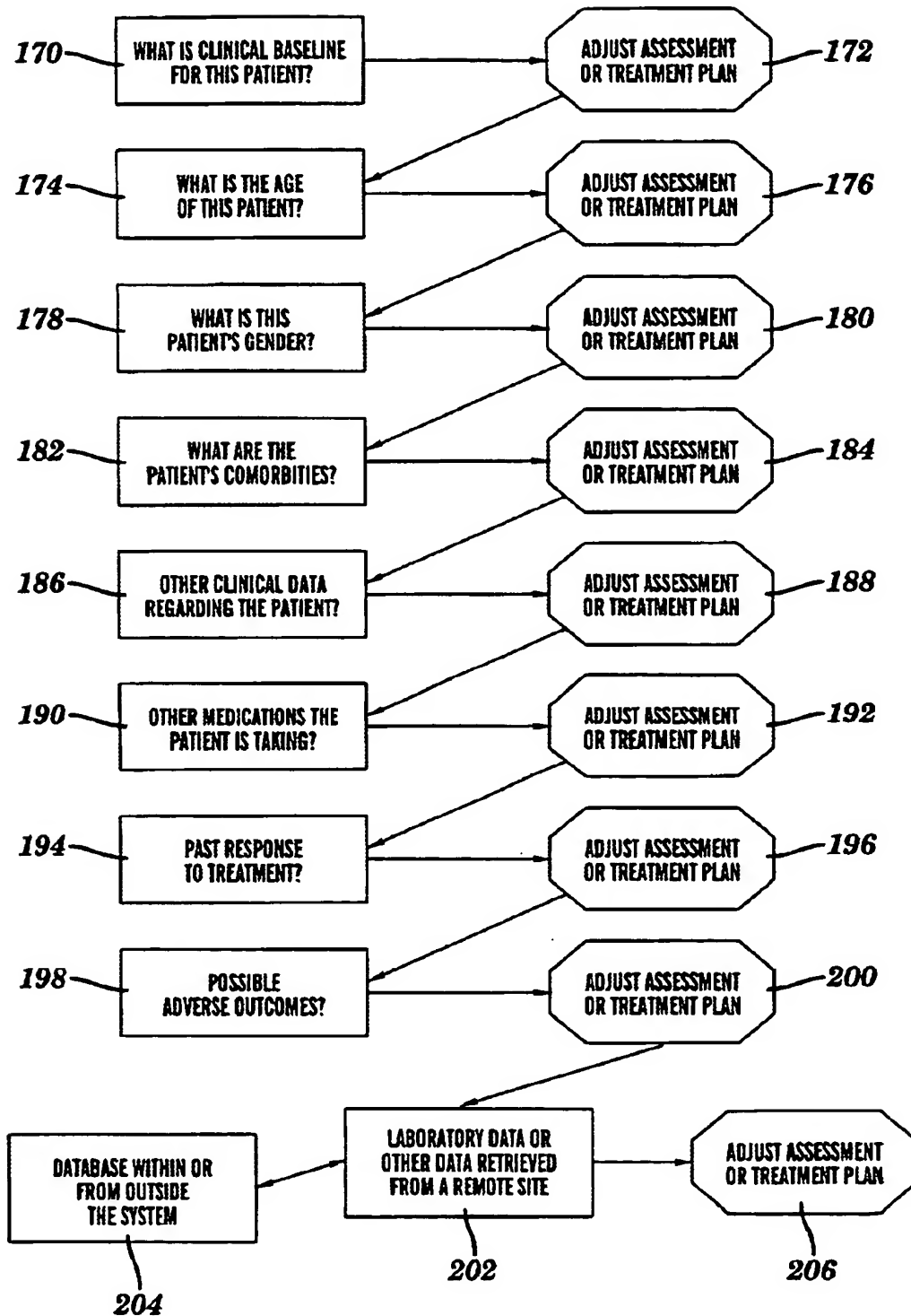
**FIG. 1**

**FIG. 2**

**FIG. 3**

**FIG. 4**

**FIG. 5**

**FIG. 6**

**PROGRAM FOR INTERNET-BASED MONITORING OF ASTHMATICS**

SERVER TIME: WEDNESDAY, FEBRUARY 21, 2001 1:00 PM EST

WELCOME JANE! PLEASE REMEMBER TO LOG OUT WHEN YOU ARE FINISHED WITH YOUR SESSION  
BY USING THE LOGOUT BUTTON ABOVE.START TODAY'S SESSIONUPDATE MY PROFILELOG OUT

IT HAS BEEN 5 DAYS SINCE YOU LAST SUBMITTED YOUR DATA.

**BASIC INFORMATION:**

FIRST NAME: JANE

LAST NAME: DOE

HEIGHT: 66 INCHES

WEIGHT: 0 POUNDS

SMOKING STATUS: NON-SMOKER

**YOUR CONTACT INFORMATION:**

ADDRESS 1: UNIVERSITY OF ROCHESTER

ADDRESS 2:

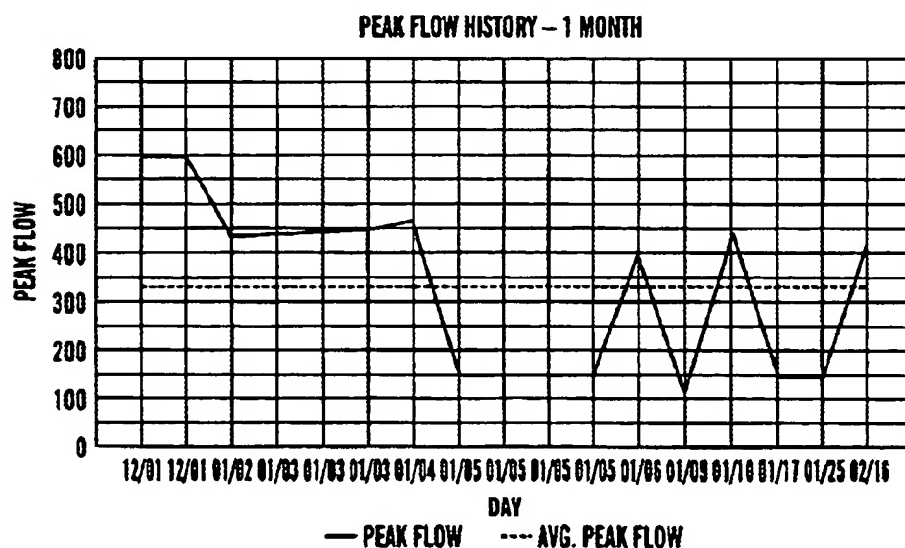
CITY: ROCHESTER

STATE: NY

ZIP: 14627

PHONE: (716) 274-4231

EMAIL: bk001i@mail.rochester.edu

**PEAK FLOW HISTORY:** **START TODAY'S SESSION****FIG. 7**



**PROGRAM FOR INTERNET-BASED MONITORING OF ASTHMATICS**

SERVER TIME: WEDNESDAY, FEBRUARY 21, 2001 1:00 PM EST

THIS IS THE FIRST PAGE OF YOUR SESSION. PLEASE CHECK YOUR DATA FOR THIS PAGE  
BEFORE YOU CONTINUE TO PAGE 2.**ALBUTEROL INHALER**

ARE YOU USING AN ALBUTEROL INHALER?

☒ YES☐ NO

IF YES, HOW MANY TIMES PER DAY?

 ▾

AND HOW MANY PUFFS EACH TIME?

 ▾SINCE YOUR LAST SESSION HAVE YOU HAD TO REFILL  
YOUR PRESCRIPTION FOR ALBUTEROL?☐ YES☒ NO**SYMPTOMS**HOW MANY DAYS SINCE YOUR LAST SESSIONS  
HAVE YOU HAD SYMPTOMS (COUGHING,  
WHEEZING, SHORTNESS OF BREATH?) ▾HOW MANY NIGHTS SINCE YOUR LAST SESSIONS  
HAVE YOU HAD SYMPTOMS (COUGHING,  
WHEEZING, SHORTNESS OF BREATH?) ▾SINCE YOUR LAST SESSION HAVE YOU HAD MORNING  
ASTHMA SYMPTOMS NOT RELIEVED BY YOUR  
ALBUTEROL INHALER?☐ YES☒ NOSINCE YOUR LAST SESSION HOW MANY TIMES  
HAVE YOU USED YOUR ALBUTEROL INHALER TO  
RELIEVE EXERCISE-INDUCED SYMPTOMS? ▾**PEAKFLOW**WHAT IS YOUR BEST PEAK FLOW READING SINCE  
YOUR LAST SESSION?

ONCE YOU HAVE CAREFULLY REVIEWED YOUR DATA FOR THIS PAGE, CONTINUE TO PAGE 2.

 CONTINUE TO PAGE 2**FIG. 8**

**PROGRAM FOR INTERNET-BASED MONITORING OF ASTHMATICS**

SERVER TIME: WEDNESDAY, FEBRUARY 21, 2001 1:01 PM EST

THIS IS THE SECOND PAGE OF YOUR PIMA DATA SESSION. YOU SHOULD CHECK OVER YOUR DATA ON THIS PAGE BEFORE YOU CONTINUE TO PAGE 3.

**CORTICOSTEROIDS**

ARE YOU USING INHALED CORTICOSTEROIDS?

☒ YES  
☐ NO

IF YES, WHICH OF THE FOLLOWING INHALED CORTICOSTEROIDS? (SELECT THE LAST OPTION, "OTHER", IF YOUR MEDICATION DOES NOT APPEAR):

FLOVENT ▾

IF YOU CHOSE "OTHER", SPECIFY HERE:

HOW MANY TIMES PER DAY?

2 ▾

HOW MANY PUFFS WITH EACH USAGE?

2 ▾

IF YOU ARE TAKING FLOVENT, PLEASE SPECIFY YOUR DOSAGE:

110 MICROGRAMS ▾

SINCE YOUR LAST SESSION HAVE YOU HAD TO REFILL YOUR PRESCRIPTION FOR CORTICOSTEROIDS?

☐ YES  
☒ NO**ORAL STEROIDS**

ARE YOU USING ORAL STEROIDS SUCH AS PREDNISONE?

☐ YES  
☒ NO**OTHER ASTHMA/ALLERGY MEDICATIONS**

ARE YOU USING OTHER MEDICATIONS FOR ASTHMA OR ALLERGIES?

☒ YES  
☐ NO

IF YES, CHOOSE YOUR MEDICATION BELOW (SELECT THE LAST OPTION, "OTHER", IF YOUR MEDICATION DOES NOT APPEAR):

ZYRTEC ▾

**FIG. 9A**

**PROGRAM FOR INTERNET-BASED MONITORING OF ASTHMATICS**

IF YOU CHOSE "OTHER", SPECIFY HERE:

SINCE YOUR LAST SESSION HAVE YOU HAD TO REFILL  
YOUR PRESCRIPTION FOR OTHER ASTHMA/ALLERGY  
MEDICATIONS?☐ YES  
☒ NO

---

SIDE EFFECTSIF YOU HAVE EXPERIENCED ANY SIDE EFFECTS FROM YOUR ASTHMA-RELATED  
MEDICATION, CHOOSE THEM FROM THE LIST BELOW:

- ☐ HEADACHES
- ☒ LIGHTEADEDNESS
- ☐ RESTLESSNESS
- ☒ PALPITATIONS
- ☐ SEDATION
- ☐ THRUSH
- ☐ ANXIETY
- ☐ TREMOR
- ☐ OTHER

---

RESPIRATORY INFECTIONDO YOU CURRENTLY HAVE A RESPIRATORY INFECTION  
(COLD, FLU, BRONCHITIS, SINUSITIS OR PNEUMONIA?)☐ YES  
☒ NO

ONCE YOU HAVE CAREFULLY REVIEWED YOUR DATA FOR THIS PAGE, CONTINUE TO PAGE 3.

 CONTINUE TO PAGE 3***FIG. 9B***

**PROGRAM FOR INTERNET-BASED MONITORING OF ASTHMATICS**

SERVER TIME: WEDNESDAY, FEBRUARY 21, 2001 1:02 PM EST

THIS IS THE THIRD AND FINAL PAGE OF YOUR PIMA DATA SESSION. ONCE YOU HAVE CHECKED OVER AND SUBMITTED YOUR DATA FOR THIS PAGE, YOU WILL BE ASKED TO REVIEW ALL OF THE DATA FOR THIS SESSION.

---

**ATHLETICS**

ARE YOU CURRENTLY INVOLVED IN ATHLETICS?

☒ YES  
☐ NO

IF YES, THEN HOW MANY DAYS SINCE YOUR LAST SESSION HAS YOUR PHYSICAL ACTIVITY BEEN CURTAILED DUE TO YOUR ASTHMA?

 ▾

HOW MANY DAYS SINCE YOUR LAST SESSION HAVE YOU HAD TO FOREGO ATHLETICS DUE TO YOUR ASTHMA?

 ▾

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**SATISFACTION AND WELL-BEING**

HOW SATISFIED DO YOU FEEL WITH THE CARE YOU ARE RECEIVING?

 ▾

THINKING OF THE DAYS SINCE YOUR LAST SESSION (INCLUDING TODAY), HOW WOULD YOU RATE HOW HEALTHY YOU HAVE BEEN?

 ▾

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**SMOKING**

HOW MANY CIGARETTES HAVE YOU SMOKED SINCE YOUR LAST SESSION?

 ▾

---

**CLINICAL/EMERGENCY ROOM/HOSPITAL VISITS AND MISSED WORK OR SCHOOL**

SINCE YOUR LAST SESSION HAVE YOU HAD ANY CLINIC VISITS?

☐ YES  
☒ NO

IF YES, HOW MANY? (ENTER NUMBER)

SINCE YOUR LAST SESSION, HAVE YOU HAD ANY VISITS TO THE EMERGENCY ROOM?

☐ YES  
☐ NO

IF YES, HOW MANY? (ENTER NUMBER)

***FIG. 10A***

**PROGRAM FOR INTERNET-BASED MONITORING OF ASTHMATICS**

PAGE 2 OF 2

**SINCE YOUR LAST SESSION, HAVE YOU BEEN  
HOSPITALIZED?**☐ YES  
☒ NO**IF YES, HOW MANY TIMES?****SINCE YOUR LAST SESSION, HAVE YOU MISSED WORK  
OR SCHOOL DUE TO ASTHMA?**☐ YES  
☒ NO**IF YES, HOW MANY DAYS?****ONCE YOU HAVE CAREFULLY REVIEWED YOUR DATA FOR THIS SESSION,  
CLICK ON "REVIEW AND SUBMIT DATA". YOU WILL THEN VIEW ALL YOUR  
ANSWERS FOR THIS SESSION.*****FIG. 10B***

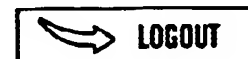
**PROGRAM FOR INTERNET-BASED MONITORING OF ASTHMATICS**

SERVER TIME: TUESDAY, FEBRUARY 20, 2001 7:21 PM EST

**YOUR DATA HAS BEEN SUCCESSFULLY UPDATED!**

**YOU SHOULD LOG ON FOR YOUR NEXT SESSION BY WEDNESDAY, JANUARY 21. PLEASE TAKE A NOTE OF THIS DATE. UNTIL THEN, AND AS ALWAYS, THANK YOU!**

**TO KEEP YOUR DATA SAFE, PLEASE REMEMBER TO FINISH BY LOGGING OUT! YOU CAN DO THIS FROM THIS PAGE OR AFTER RETURNING TO YOUR HOME PAGE TO VIEW YOUR UPDATED PERFORMANCE GRAPH.**



***FIG. 11***

**PROGRAM FOR INTERNET-BASED MONITORING OF ASTHMATICS**

TUES. FEB. 20 19:20:42 GMT-0500 2001

YOU ARE ALMOST FINISHED WITH THIS SESSION. BE SURE TO REVIEW THE DATA ON THIS PAGE TO MAKE SURE ALL THE DATA IS CORRECT. IF YOU FIND ERRORS, YOU SHOULD REDO THIS SESSION. WHEN YOU ARE FINISHED, PLEASE REMEMBER TO LOG OUT FROM YOUR SESSION.

HERE IS ALL OF THE DATA YOU ENTERED FOR THIS SESSION:

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**ALBUTEROL INHALER**

USING AN ALBUTEROL INHALER:	YES
NUMBER OF TIMES PER DAY:	3
NUMBER OF PUFFS EACH TIME:	2
PRESCRIPTION REFILL FOR ALBUTEROL SINCE YOUR LAST SESSION:	YES

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**SYMPTOMS**

NUMBER OF DAYS SINCE YOUR LAST SESSION HAVE YOU HAD SYMPTOMS (COUGHING, WHEEZING, SHORTNESS OF BREATH):	4
NUMBER OF NIGHTS SINCE YOUR LAST SESSION YOU HAVE HAD SYMPTOMS:	2
ASTHMA SYMPTOMS NOT RELIEVED BY YOUR ALBUTEROL INHALER SINCE YOUR LAST SESSION:	NO
NUMBER OF TIMES SINCE YOUR LAST SESSION YOU USED YOUR ALBUTEROL INHALER TO RELIEVE EXERCISE-INDUCED SYMPTOMS:	-1

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**PEAKFLOW**

YOUR BEST PAK FLOW READING SINCE YOUR LAST SESSION:	700
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***FIG. 12A***

**CORTICOSTEROIDS**

USING INHALED CORTICOSTEROIDS:	YES
NAME OF CORTICOSTEROIDS:	AEROBID, AEROBID-M
NUMBER OF TIMES CORTICOSTEROIDS USED PER DAY:	1
NUMBER OF PUFFS WITH EACH USAGE:	1
CORTICOSTEROID PRESCRIPTION REFILLED SINCE YOUR LAST SESSION:	NO

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**ORAL STEROIDS**

USING ORAL STEROIDS SUCH AS PREDNISONE:	YES
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**OTHER ASTHMA/ALLERGY MEDICATIONS**

USING OTHER MEDICATIONS FOR ASTHMA OR ALLERGIES:	YES
WHICH MEDICATION:	ACCOLATE
PRESCRIPTION REFILL FOR OTHER ASTHMA/ALLERGY MEDICATIONS SINCE YOUR LAST SESSION:	NO

**SIDE EFFECTS**

SIDE EFFECTS YOU ARE EXPERIENCING FROM ASTHMA-RELATED MEDICATION:	LIGHTEADEDNESS SEDATION
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**RESPIRATORY INFECTION**

CURRENT RESPIRATORY INFECTION (COLD, BRONCHITIS, SINUSITIS, OR PNEUMONIA)	NO
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**ATHLETICS**

CURRENT ATHLETIC INVOLVEMENT:	YES
NUMBER OF DAYS SINCE YOUR LAST SESSION THAT PHYSICAL ACTIVITY HAS BEEN CURTAILED BY ASTHMA (IF YES ABOVE):	1
NUMBER OF DAYS SINCE YOUR LAST SESSION YOU HAVE HAD TO FOREGO ATHLETIC ACTIVITY DUE TO ASTHMA:	-1

**FIG. 12B**



**SATISFACTION AND WELL-BEING**

**YOUR SATISFACTION WITH THE CARE YOU ARE RECEIVING:** **SATISFIED**

**YOUR SUBJECTIVE RATING OF WELL-BEING FOR DAYS  
SINCE LAST SESSION, INCLUDING TODAY:** **GOOD**

**PLAN OF ACTION FOR YOUR ASTHMA SHOULD YOUR  
SYMPTOMS WORSEN:** **YES**

---

**SMOKING**

**APPROXIMATE NUMBER OF CIGARETTES SMOKED SINCE LAST SESSION** **20-30**

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**CLINIC/EMERGENCY ROOM/HOSPITAL VISITS AND MISSED WORK OR SCHOOL**

**CLINIC VISITS SINCE LAST SESSION:** **YES**

**HOW MANY:** **1**

**EMERGENCY ROOM VISITS SINCE LAST SESSION:** **YES**

**NUMBER (IF YES):** **1**

**HOSPITAL STAYS SINCE LAST SESSION:** **YES**

**NUMBER (IF YES):** **1**

**HAVE YOU MISSED ANY WORK OR SCHOOL SINCE YOUR LAST SESSION:** **YES**

**NUMBER OF DAYS OF WORK/SCHOOL MISSED SINCE YOUR LAST SESSION:** **1**

**ONCE YOU HAVE CAREFULLY LOOKED OVER YOUR DATA FOR THIS SESSION,  
CLICK ON FINISH**



***FIG. 12C***

1

## METHOD AND SYSTEM FOR MONITORING AND TREATING A PATIENT

### FIELD OF THE INVENTION

This invention relates generally to a health care method and system and, more particularly, to a method and system for monitoring and treating a patient who has one or more diagnosed conditions and is located at a remote location from a treatment processing system.

### BACKGROUND OF THE INVENTION

Monitoring patients with chronic illnesses, such as congestive heart failure, diabetes and asthma, represents one of the greatest challenges facing medicine today. Patients with chronic illnesses require ongoing, follow up treatment and care to properly manage their conditions. Unfortunately, a number of these patients do not receive ongoing treatment and care, receive ongoing treatment and care on a sporadic basis, or receive ongoing treatment and care which is not in accordance with recommended guidelines. As a result, these patients often unnecessarily suffer from symptoms of their chronic illness which could have been minimized or prevented with proper ongoing treatment and care. Additionally, some of these patients require hospitalization visits which may have been preventable and, tragically, a few of these patients may die as a result of receiving improper ongoing, treatment and care.

More specifically, and by way of example, asthma affects about fifteen million people in the United States. Long term control of asthma is possible with medications such as inhaled steroids, but in order to reduce adverse effects, use of the lowest possible dose is recommended. Determining the proper dosage requires ongoing monitoring of the patient. Monitoring of patient status is possible with the use of simple Peak Flow Meter measurements of breath rate, which the patient can do himself. Unfortunately, many patients with asthma are not properly monitored and cared for on an ongoing basis. Studies of children and adults have found that less than 50% of the patients were receiving anti-inflammatory therapy as recommended by the NIH Guidelines and only 28% of the adult patients had written action plans that told them how to manage their asthma and control an exacerbation, as set forth in the "Practical Guide for the Diagnosis and Management of Asthma," NIH publication 974053, 1997, p. 1. As a result, asthma is the third leading cause of preventable hospitalizations in the United States. Asthma causes 1.5 million emergency room visits, 470,000 hospitalizations and more than 5000 deaths annually, at least a portion of which are preventable.

One possible solution to this problem is internet-based monitoring of patients. Internet-based monitoring of chronically ill patients is in its infancy, but provides an attractive platform for the surveillance of such patients. A trial in 1998 found that patients using Patient Infosystem's internet-based asthma disease management system had: 36% lower health costs; 52% fewer urgent physician visits; and 67% fewer emergency room visits compared to usual care patients as set forth at <http://www.ptisys.com/web/news/1998/pr11-10-98.html>. These are promising results.

Another approach is disclosed in U.S. Pat. No. 6,024,699 for, "Systems, Methods, and Computer Program Products for Monitoring, Diagnosing, and Treating Medical Conditions of Remotely Located Patients" which is herein incorporated by reference. With this system, method, and product, medical conditions of a plurality of remotely located patients

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are monitored, diagnosed, prioritized and treated using a central data processing system configured to communicate with and receive data from a plurality of respective patient monitoring systems. Unfortunately, there are a number of limitations with this approach. For example, this approach fails to take into account subjective data on each patient's condition, does not customize a diagnosis and a treatment plan based on the each patient's particular medical history, does not directly notify an emergency service provider in the event of a detected emergency, and does not monitor physician compliance with prescribed treatment guidelines in treating these patients.

### SUMMARY OF THE INVENTION

A method for monitoring and treating a patient with one or more diagnosed conditions in accordance with one embodiment of the present invention includes a few steps. A current assessment of each of the diagnosed conditions is determined in a treatment processing system. The current assessment is based on objective data and subjective data about each of the diagnosed conditions from the patient who is at a remote location and on one or more assessment guidelines for each of the diagnosed conditions. Next, an existing treatment plan for each of the diagnosed conditions is updated using the treatment processing system. The updated treatment plan is based on the existing treatment plan, the current assessment and on one or more treatment guidelines for each of the diagnosed conditions. The updated treatment plan for each of the diagnosed conditions is then transmitted to the patient for application by the patient at the remote location.

A system for monitoring and treating a patient with one or more diagnosed conditions in accordance with another embodiment of the present invention includes an assessment processing system and a treatment processing system. The assessment processing system determines a current assessment of each of the diagnosed conditions based on objective data and subjective data about each of the diagnosed conditions from the patient and on one or more assessment guidelines for each of the diagnosed conditions. The treatment processing system updates an existing treatment plan for each of the diagnosed conditions based on the existing treatment plan, the current assessment and on one or more treatment guidelines for each of the diagnosed conditions to generate an updated treatment plan for each of the diagnosed conditions.

A method for monitoring and treating a patient with one or more diagnosed conditions in accordance with another embodiment of the present invention also includes a few steps. First, a current assessment of each of the diagnosed conditions is determined using a treatment processing system. The current assessment is based on data about each of the diagnosed conditions from the patient who is at a remote location and on one or more assessment guidelines for each of the diagnosed conditions. Next, an existing treatment plan for each of the diagnosed conditions is updated using the treatment processing system. The updated treatment plan for each of the diagnosed conditions is generated based on the existing treatment plan, the current assessment, and on one or more treatment guidelines for each of the diagnosed conditions. In this process, at least one of the current assessment or the updated treatment plan for each of the diagnosed conditions is also determined or updated based on one or more customized guidelines.

A system for monitoring and treating a patient with one or more diagnosed conditions in accordance with another

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embodiment of the present invention includes an assessment processing system and a treatment processing system. The assessment processing system determines a current assessment of each of the diagnosed conditions. The current assessment is based on data about each of the diagnosed conditions from the patient who is at a remote location and on one or more assessment guidelines for each of the diagnosed conditions. The treatment processing system updates an existing treatment plan for each of the diagnosed conditions. The updated treatment plan is generated based on the current assessment and the on one or more treatment guidelines for each of the diagnosed conditions. With this system, at least one of the current assessment or the updated treatment plan for each of the diagnosed conditions is also determined or updated based on one or more customized guidelines for the patient.

A method for monitoring for a patient with one or more diagnosed conditions in accordance with yet another embodiment of the present invention includes a few steps. First, a current assessment of each of the diagnosed conditions is determined using a treatment processing system. The current assessment is based on data about each of the diagnosed conditions from the patient who is at a remote location and on one or more assessment guidelines for each of the diagnosed conditions. Next, a determination is made on whether or not the current assessment indicates an emergency. If the current assessment indicates the emergency, then at least a portion of the data is confirmed with the patient. An emergency service provider is notified of the emergency with the patient if the confirmation of the data from the patient is received.

A system for monitoring for a patient with one or more diagnosed conditions in accordance with yet another embodiment of the present invention includes an assessment processing system, a warning system, a confirmation system, and a notification system. The assessment system determines a current assessment of each of the diagnosed conditions based on data about each of the diagnosed conditions from the patient who is at a remote location and on one or more assessment guidelines for each of the diagnosed conditions. The warning system determines if the current assessment indicates an emergency. The confirmation system confirms at least a portion of the data with the patient if the current assessment indicates the emergency. The notification system that notifies an emergency service provider of the emergency with the patient if the confirmation of the data from the patient is received.

A method for tracking compliance of treatment of patients in accordance with yet another embodiment of the present invention includes a few steps. First, a current assessment of each of the diagnosed conditions is determined using a treatment processing system based on data about each of the diagnosed conditions from the patient who is at a remote location and on one or more assessment guidelines for each of the diagnosed conditions. Next, an existing treatment plan for each of the diagnosed conditions is updated using the treatment processing system based on the existing treatment plan, the current assessment, and on one or more treatment guidelines for each of the diagnosed conditions to generate an updated treatment plan for each of the diagnosed conditions. Next, the patient is provided with a reviewed treatment plan based on the updated treatment plan for each of the diagnosed conditions. Next, compliance data based on the reviewed treatment plans and the updated treatment plans is generated and provided.

A system for tracking compliance in monitoring and treating patients in accordance with yet another embodiment

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of the present invention includes an assessment processing system, a treatment processing system, a presentation system, and a compliance processing system. The assessment processing system determines a current assessment of each of the diagnosed conditions using a treatment processing system based on data about each of the diagnosed conditions from the patient who is at a remote location and on one or more assessment guidelines for each of the diagnosed conditions. The treatment processing system updates an existing treatment plan for each of the diagnosed conditions using the treatment processing system based on the existing treatment plan, the current assessment, and on one or more treatment guidelines for each of the diagnosed conditions to generate an updated treatment plan for each of the diagnosed conditions. The presentation system provides the patient with a reviewed treatment plan based on the updated treatment plan for each of the diagnosed conditions. The compliance processing system generates and provides compliance data based on the reviewed treatment plans and the updated treatment plans.

The present invention provides a unique method and system for monitoring and treating chronically ill patients with a number of advantages. The method and system are applicable to a myriad illnesses and utilizes the Internet to monitor and treat chronically ill patients. With the present invention not only are costs associated with direct treatment by the physician reduced, but also patient compliance to his/her treatment protocol and compliance by the physician to standard NIH treatment guidelines or guidelines from other authoritative organizations is also reinforced.

The present invention develops ongoing treatment plans that more effectively respond to the problem or problems each patient is facing with their chronic illness by evaluating both objective and subjective data from the patient about each of the conditions. With the subjective data, the present invention can also develop treatment plans that not only focus on treating the condition, but on treating the condition in a manner that minimizes the disruption on and quality of a patient's daily life.

The present invention also develops ongoing treatment plans that more effectively respond to the problem or problems each patient is facing with their chronic illness by using customized guidelines or algorithms which are based on each patient's particular medical history. With these customized guidelines, the present invention can also develop treatment plans that not only focus on more effectively treating the condition, but also on treating the condition in a manner that minimizes the disruption on and quality of a patient's daily life.

Additionally, the present invention provides notification directly to an emergency service provider when an emergency condition is detected. As a result, there is a higher chance that an emergency or potential emergency will be identified and treated as soon as possible.

Further, the present invention monitors physician and patient compliance with prescribed treatment guidelines, such as those provided by NIH. This monitoring should help provide physicians, medical facilities and organizations, such as HMO's and physician review boards, with important feedback on physician's compliance with treatment guidelines and the patient's compliance with treatment regimens.

#### BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a block diagram of a system for monitoring and treating a patient who has one or more diagnosed conditions in accordance with one embodiment of the present invention;

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FIG. 2 is a flow chart of a method for obtaining data from a patient who has one or more diagnosed conditions in accordance with one embodiment of the present invention;

FIG. 3 is a flow chart of a method for assessing each of the diagnosed conditions of the patient in accordance with one embodiment of the present invention;

FIG. 4 is a flow chart of a method for updating a treatment plan for each of the diagnosed conditions of the patient in accordance with one embodiment of the present invention;

FIG. 5 is a flow chart of a method for obtaining more information relating to the updated treatment plan in accordance with one embodiment of the present invention;

FIG. 6 is a flow chart of a method for modifying an assessment and/or a treatment plan based on prior information about that particular patient in accordance with one embodiment of the present invention;

FIG. 7 is a screen shot of a home page of an interactive user interface on display on a display device in accordance with one embodiment of the present invention;

FIG. 8 is a screen shot of a first page of an interactive user interface on display on a display device used in accordance with one embodiment of the present invention;

FIGS. 9A and 9B are screen shots of a second page of an interactive user interface on a display on a display device used in accordance with one embodiment of the present invention;

FIGS. 10A and 10B are screen shots of a third page of an interactive user interface on a display on a display device used in accordance with one embodiment of the present invention;

FIG. 11 is a screen sheet of a page of an interactive user interface on display on a display device at the end of data collection used in accordance with one embodiment of the present invention; and

FIGS. 12A-12C are screen shots of a page of an interactive user interface on a display on a display device used to review and confirm data entered in accordance with one embodiment of the present invention.

#### DETAILED DESCRIPTION

A system 10 and method for monitoring and treating a patient who has one or more diagnosed conditions or illnesses and is located at a remote location from a treatment processing system in accordance with one embodiment of the present invention is illustrated in FIGS. 1-6. Among other features, the present invention develops ongoing treatment plans that more effectively respond to the problem or problems each patient is facing with their chronic illness, as well as providing notification to emergency service providers in the event of an emergency and tracking physician compliance with prescribed treatment guidelines.

Referring to FIG. 1, the system 10 includes a treatment processing system 12, a patient processing system 14, an optional self-monitoring device, an optional provider processing system 18, and an optional communication device 20 in this particular embodiment, although system 10 may have other components, other numbers of the components, and other combinations of the components. The patient processing system 14 is operatively coupled to the treatment processing system 12 which is operatively coupled to the provider processing system 18 and the communication device 20. A variety of communication systems and/or methods can be used to operatively couple and communicate between the treatment processing system 12 and the patient processing system 14, the provider processing system 18,

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and the communication device 20, including a direct connection, a local area network, a wide area network, the world wide web, modems and phone lines, or wireless communication technology each having communications protocols. Although one configuration for the system 10 is shown, other configurations are possible and envisioned.

The treatment processing system 12 includes at least one processor, at least one memory storage device, and at least one input/output user interface which are coupled together by a bus system or other link, although the treatment processing system 12 may comprise other components, other numbers of the components, and other combinations of the components. The processor executes a program of stored instructions for at least a portion of the method for monitoring and treating a patient who has one or more diagnosed conditions in accordance with one embodiment of the present invention as described herein and set forth in FIGS. 2-6. A variety of different types of memory storage devices, such as a random access memory (RAM) or a read only memory (ROM) in the system or a floppy disk, hard disk, CD ROM, or other computer readable medium which is read from and/or written to by a magnetic, optical, or other reading and/or writing system that is coupled to the processor, can be used to store the programmed instructions described herein as well as other information. The input/output user interface is used to operatively couple and communicate between the treatment processing system 12 and the patient processing system 14, the provider processing system 18, and the communication device 20. Although in his particular embodiment, the method in accordance with one embodiment of the invention is stored as programmed instructions in the treatment processing system 12 for execution by the treatment processing system 12, some or all of the programmed instructions could be stored and executed elsewhere. By way of example only, the programmable instructions could be stored and executed by the provider processing system 18 in communication with the patient processing system 14 without a separate treatment processing system 12.

The patient processing system 14 includes at least one processor, at least one memory storage device, at least one input/output user interface, at least one display device, and at least one user input device which are coupled together by a bus system or other link, although the patient processing system 14 may comprise other components, other numbers of the components, and other combinations of the components. The processor for the patient processing system 14 executes a program of stored instructions for at least a portion of the method for monitoring and treating a patient who has one or more diagnosed conditions in accordance with one embodiment of the present invention as described herein and set forth in FIGS. 2-6. A variety of different types of memory storage devices, such as a random access memory (RAM) or a read only memory (ROM) in the system or a floppy disk, hard disk, CD ROM, or other computer readable medium which is read from and/or written to by a magnetic, optical, or other reading and/or writing system that is coupled to the processor, can be used to store the programmed instructions described herein as well as other information. The input/output user interface is used to operatively couple and communicate between the patient processing system 14 and the treatment processing system 12 and may be used to operatively couple and communicate between the patient processing system 14 and the self monitoring device. The display device displays information for the operator, such as the updated treatment plan for the patient or a request to enter in objective and/or subjective

data about one or more diagnosed conditions. A variety of different types of display devices can be used, such as a monitor, printer, or any other type of device which can convey information to the user of the patient processing system 14. The user input device enables an operator to generate and transmit signals or commands to the patient processing system 14. A variety of different types of user input devices can be used, such as a keyboard, computer mouse, or any other user input device which provides a mechanism for a user or operator.

In this particular embodiment, one self monitoring device is illustrated, although the number of self monitoring devices can vary as needed for the particular patient or disease. The self monitoring device is used by the patient or other individual assisting the patient to gather objective data about one or more of the patient's diagnosed conditions. The self monitoring device may be operatively coupled to the patient processing system 14 to transfer the objective data gathered by the device or the objective data can be entered in manually by the patient or other operator. A variety of different types of self-monitoring devices can be used, such as a peak flow measuring device, a blood sugar measurement device, or a blood pressure measuring device.

The provider processing system 18 includes at least one processor, at least one memory storage device, at least one input/output user interface, at least one display device, and at least one user input device which are coupled together by a bus system or other link, although the provider processing system 18 may comprise other components, other numbers of the components, and other combinations of the components. The processor for the provider processing system 18 executes a program of stored instructions for at least a portion of the method for monitoring and treating a patient who has one or more diagnosed conditions in accordance with one embodiment of the present invention as described herein and set forth in FIGS. 2-6. A variety of different types of memory storage devices, such as a random access memory (RAM) or a read only memory (ROM) in the system or a floppy disk, hard disk, CD ROM, or other computer readable medium which is read from and/or written to by a magnetic, optical, or other reading and/or writing system that is coupled to the processor, can be used to store the programmed instructions described herein as well as other information. The input/output user interface is used to operatively couple and communicate between the provider processing system 18 and the treatment processing system 12 and may be used to operatively couple and communicate between the provider processing system 18 and the self monitoring device. The display device displays information for the operator, such as the updated treatment plan for the patient or a request to enter in objective and/or subjective data about one or more diagnosed conditions. A variety of different types of display devices can be used, such as a monitor, printer, or any other type of device which can convey information to the user of the provider processing system 18. The user input device enables an operator to generate and transmit signals or commands to the provider processing system 18. A variety of different types of user input devices can be used, such as a keyboard, computer mouse, or any other user input device which provides a mechanism for a user or operator.

In this particular embodiment, one communication device 20 is illustrated, although the number of communication devices can vary as needed for the particular patient. The communication device 20 is used by the patient or other individual assisting the patient to gather objective data about one or more of the patient's diagnosed conditions. The

communication device 20 may be operatively coupled to communicate with the treatment processing system 12 to, for example, receive information about the assessment and/or proposed modifications to a patient's treatment plan or to notify an emergency service provider of an emergency. A variety of different types of communication devices can be used, such as a pager or a wireless telephone.

The operation of system 10 and method for monitoring and treating a patient who has one or more diagnosed conditions and is located at a remote location from a treatment processing system 12 in accordance with one embodiment of the present invention will be discussed with reference to FIGS. 1-12C.

Referring to FIG. 2, at step 100 the method in accordance with one embodiment of the present invention begins and the patient or other individual assisting the patient uses the self-monitoring device to obtain objective data for the relevant illness or illnesses. A variety of different types of self-monitoring devices may be used depending upon the type of objective data that is sought. By way of example only, if the patient were diabetic they would obtain a finger stick blood glucose level.

Next, in this particular embodiment at step 102 the patient makes a subjective self-evaluation of each of the diagnosed conditions to obtain subjective data. The subjective data can include a variety of different types of subjective information, including symptomatology and the patient's subjective feelings on his or her well being. Typically, the subjective data will be obtained in response to specific inquiries received by the patient through the patient processing system 14 and displayed on the display device coupled to the patient processing system 14, although the subjective data can be obtained in other manners. By way of example only, if the patient were diabetic they would subjectively gauge their wellness and severity of symptoms. Additionally, in this particular embodiment, the patient also enters data or information on the patient's actual implementation of the treatment plan, such as the patient's usage of pharmaceuticals and other medical devices. The type of and amount of data or information and entered here can vary based on the particular application.

Next at step 104, the patient enters or facilitates the entry of the objective and/or the subjective data to the patient processing system 14 using the user input device, such as a keyboard or mouse. As discussed earlier, the self monitoring devices may be operatively coupled to the patient processing system 14 and/or to the treatment processing system 12 to automatically transfer the objective data obtain about the patient's condition. By way of example only, some screen shots of user interfaces for collecting objective and subjective data from the patient are illustrated in FIGS. 7, 8, 9A, 9B, 10A, 10B, and 11. The types of and number of questions asked and data collected can vary as need for the particular application. The exemplary screen shots in this particular embodiment are related to an application for monitoring and treating a patient with asthma, although the screen shots can be modified to solicit data on a variety of different types of conditions, such as diabetes or a heart condition. The patient would see these user interfaces on the display of the patient processing system 14 and would respond to questions on the user interface using a user input device, such as a keyboard or mouse, for the patient processing system 14.

Referring back to FIG. 2, at step 106, the patient may also receive reminders generated by the patient processing system 14 or from a transmission from the treatment processing system 12 regarding other health care related matters, such

as reminders for immunization and in person check-ups. In step 108, the patient at the patient processing system 14 can interface with the provider at the provider processing center regarding the other health care related matters, such as assisting the patient in making appointments for immunizations or in-person check-ups.

Next in step 110, the display device at the patient processing system 14 displays the objective and/or subjective data supplied by the patient and requests confirmation of the each piece of data by the patient. By way of example only, some screen shots of user interfaces for reviewing and confirming the objective and subjective data from the patient are illustrated in FIGS. 12A-12C. The process for reviewing and confirming entered data as well as the type data reviewed can vary as need for the particular application. Referring back to FIG. 2, in this particular embodiment using the user input device, such as a mouse or keyboard, in step 112 the patient enters a response to the request to confirm each piece of the data into the patient processing system 14 which is transmitted to the treatment processing system 12. Although in this particular example, a confirmation for all of the objective and subjective data is sought, other variations for confirming the data may be sought, such as a confirmation of just a portion of the data.

If the data is not confirmed by the patient, then the No branch is taken from step 112 to step 114. In step 114, the patient is referred back to step 100 or 102 depending upon which portion of the data was not confirmed and then the steps subsequent to that step would be repeated again as described above. If the data is confirmed by the patient, then the Yes branch is taken from step 112 to step 116.

In step 116, the confirmed objective data and subjective data is transmitted from the patient processing system 14 to the treatment processing system 12. Next, in step 118 the confirmed objective data and subjective data is received by the treatment processing system 12, although the data could be received by other processing systems, such as the provider processing system 18.

Referring to FIG. 3, in step 120 a clinical assessment of each of the patient's diagnosed conditions is made using an algorithm for each of the diagnosed conditions which is stored as programmable instructions in the treatment processing system 12 in this particular embodiment. Each of the algorithms represents or is adapted from established guidelines for clinical assessment of an established disease, such as asthma or diabetes, from a source, such as the NIH or another authoritative organization.

The clinical assessment being made in step 120 may also be made in conjunction with secondary algorithm or algorithms in step 122. The secondary algorithm or algorithms provide further interpretation of the newly received objective data and/or the subjective data from the patient and may necessitate modification of the initial clinical assessment. A variety of different types of secondary algorithms tailored to each patient based on the patient prior history can be used. In this particular embodiment, the secondary algorithms are based on past objective and subjective data on the diagnosed conditions from the patient and also prior experience with the patient relating to these diagnosed conditions and prior treatment plans. By way of example only, a secondary algorithm might utilize information on a patients' risk factors, comorbidities, age, gender, past response to therapeutic intervention, and other objective/subjective data not initially received from the patient to make and/or adjust the clinical assessment.

Referring to FIG. 6, one example of a secondary algorithm used to possibly adjust the assessment in this particu-

lar embodiment is illustrated. In this example, in step 170 a clinical baseline for the patient is obtained from a memory device or by inquiring from another source, such as a provider processing system 18. Next, in step 172 the assessment being determined in step 120 may be adjusted based on the information obtained in step 170. Next, in step 174 the patient's age is obtained from a memory device or by inquiring from another source, such as the patient processing system 14. Next, in step 176 the assessment being determined in step 120 may be adjusted based on the information obtained in step 174. Next, in step 178 the patient's gender is obtained from a memory device or by inquiring from another source, such as the patient processing system 14. Next, in step 180 the assessment being determined in step 120 may be adjusted based on the information obtained in step 178. Next, in step 182 the patient's comorbidities are obtained from a memory device or by inquiring from another source, such as the patient processing system 14. Next, in step 184 the assessment being determined in step 120 may be adjusted based on the information obtained in step 182. Next, in step 186 other clinical data about the patient is obtained from a memory device or by inquiring from another source, such as the patient processing system 14 or the provider processing system 18. Next, in step 188 the assessment being determined in step 120 may be adjusted based on the information obtained in step 186. Next, in step 190 other medication(s) the patient is taking are obtained from a memory device or by inquiring from another source, such as the patient processing system 14 or provider processing system 18. Next, in step 192 the assessment being determined in step 120 may be adjusted based on the information obtained in step 190. Next, in step 194 the patient's past response to treatment is obtained from a memory device or by inquiring from another source, such as the patient processing system 14 or provider processing system 18. Next, in step 196 the assessment being determined in step 120 may be adjusted based on the information obtained in step 194. Next, in step 198 possible adverse outcomes in the patient's history are obtained from a memory device or by inquiring from another source, such as the patient processing system 14 or provider processing system 18. Next, in step 200 the assessment being determined in step 120 may be adjusted based on the information obtained in step 198. Next, in steps 202 and 204 laboratory data and/or other data for the patient's age is obtained from a memory device within or outside the system. Next, in step 206 the assessment being determined in step 120 may be adjusted based on the information obtained in steps 202 and 204. Although one example of a secondary algorithm is shown, a variety of different types of algorithms or processes based on a patient's prior data or history could be used. One or more of the pieces of information obtained in steps 170, 174, 178, 182, 186, 190, 194, 198, 202, and 204, could be considered and analyzed together to adjust the assessment being determined in step 120. Additionally, a variety of other pieces of information about the patient which are not shown could also be obtained and used to adjust the assessment depending upon the particular application. For example, a secondary algorithm used to adjust an assessment being made for a patient with asthma would be different from one for a patient with diabetes. The secondary algorithm for assessing and/or treating asthma might use information about a patient's prior peak flow readings with prior treatment plans while a secondary algorithm for assessing and/or treating diabetes might use information about a patients prior blood sugar levels with prior treatments.

Referring back to FIG. 3, in step 124, a determination is made whether any of the clinical assessments for the patient



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indicate a potential emergency or an actual emergency by the treatment processing system 12, although other processing systems in system 10 could be used. This determination is made using an algorithm with established guidelines or criteria for determining if an potential emergency or actual emergency exists. By way of example only, if the objective data relates to the patient's blood pressure and heart rate and this objective data is above or below certain set or established thresholds then a potential emergency or actual emergency will be declared by the treatment processing system 12.

If no potential emergency or actual emergency is determined in step 124, then the No branch is taken to step 138. In step 138, the final clinical assessment or assessments for each of the diagnosed conditions is formulated by the treatment processing system 12, although other processing systems in system 10 could be used. Additionally, in this particular embodiment in step 138 if sub-optimal clinical performance is detected, but it is not detected to be an emergency or potential emergency a notice to the patient's physician is sent via appropriate modalities of the non-emergent, but sub-optimal performance, such as to the communication device 120 and/or to provide processing system 18.

If a potential emergency or actual emergency is determined in step 124, then the Yes branch is taken to step 126. In step 126, a request is sent to the patient processing system 14 for the patient to confirm some or all of the objective and/or subjective data or otherwise state whether some or all of the objective and/or subjective data is correct, although the request could be sent to the patient in other manners and using other devices, such as another communication device 20. If the patient responds that some or all of the objective and/or subjective data is incorrect using user input device to the patient processing system 14, then the Incorrect or No branch is taken to step 128. In step 128, the patient is referred back to step 114 to correct the error or errors in the objective and/or subjective data entered. Although in this particular embodiment the confirmation is sent using the patient processing system 14, other manners and using other devices, such as another communication device 20.

If the patient responds that some or all of the objective and/or subjective data is correct, then the Correct or Yes branch is taken to step 130 where the treatment processing system 12 receives the confirmation from the patient that the data is correct.

Next in step 132, the treatment processing system 12 sends detailed instructions to the patient processing system 14 for the patient to view of the display and implement relating to how to respond to the potential or actual emergency, e.g. instruction to call an ambulance or to take a certain amount of a medication, although other manners and/or devices for communicating these instructions to the patient could be used. Meanwhile in step 134, the provider or physician treating the patient or another provider, such as an ambulance service or other emergency server is contacted about the existence of and information about the detected potential or actual emergency with the patient, including patient contact information. As a result, in the event of a potential emergency or an actual emergency, emergency care can be dispatched to the patient as soon as possible. Next in step 136, communication between the patient at the patient processing system 14 and the provider at the provider processing system 18 is facilitated. In this particular embodiment, the communication is facilitated through the internet using e-mail, although other manners and/or devices for communicating these instructions to the patient could be used.

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Referring to FIG. 4, in step 140 an existing treatment plan for each of the diagnosed conditions is retrieved from a memory storage device in the treatment processing system 12 and is then updated or modified by the treatment processing system 12 based on the clinical assessment from step 138. Although the treatment plans could be stored elsewhere and the treatment plan can be updated or modified by other processing systems in system 10. More specifically, the treatment plan is updated or modified using the clinical assessment from step 138 and an algorithm that represents or is adapted from established guidelines for treatment of relevant the disease or illness, such as the guidelines from NIH. Based on the clinical assessment, the algorithm may determine that no modification or update to the existing treatment plan is necessary and in that case the updated treatment plan will be the existing treatment plan. In step 140, in determining the updated treatment plan, the system 10 may compare the updated treatment plan with the prior treatment plan and/or the treatment plan being carried out by the patient, i.e. the patient may not be following some or all of the prior instructions in the treatment plan. For example, if a patient is not following an existing treatment plan and is missing doses of his/her medication, then the update treatment plan may not change the dosage of the medication, but instead will simply inform the patient to follow the originally prescribed treatment plan.

The treatment plan being updated or modified in step 140 may also be modified or updated in conjunction with a secondary algorithm or algorithms in step 142 in the treatment processing system 12, although other processing systems in system 10 could be used. The secondary algorithm or algorithms provide further interpretation of the updated treatment plan and may necessitate or eventuate modification of the updated treatment plan in step 140. A variety of different types of secondary algorithms tailored to each patient based on the patient prior history can be used. In this particular embodiment, the secondary algorithms are based on prior experience with the patient relating to the prior treatment plans. By way of example only, one example of a secondary algorithm used to possibly adjust the treatment plan in this particular embodiment is illustrated in FIG. 6. Since this flowchart has been described earlier, the process will not be described again here except that in steps 172, 176, 180, 184, 188, 192, 196, 200, and/or 206 an adjustment to the treatment plan being determined in step 140 may be made based on one or more piece of information or data obtained in steps 170, 174, 178, 182, 186, 190, 194, 198, 202, and 204 in this example. Additionally, a variety of other pieces of information about the patient's prior history or other data or information which are not shown could also be obtained and used to adjust the treatment plan depending upon the particular application.

In step 144, a determination is made on whether a modification or modifications to the existing treatment plan for each diagnosed condition has been made in step 140 and/or step 142. If no modifications were made to the existing treatment plan for each diagnosed condition, then the update treatment plan is the existing treatment plan and the No branch is taken from step 144 to step 158. In step 158, the updated treatment plans are displayed on the display device by the patient processing system 14 for review and application by the patient, although other methods and devices for communicating the updated treatment plan or plans to the patient could be used.

If a modification or modifications was/were made to the existing treatment plan for at least one of the diagnosed conditions, then the Yes branch is taken from step 144 to step

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146 for each updated treatment plan with at least one modification. In step 146, a determination is made on whether the modification or modifications to the existing treatment plan can be made without approval from a provider. In this particular embodiment, the treatment processing system 12 makes this determination, although other processing systems in system 10 could be used to make this determination. By way of example only, a modification to prescribe a new medication for the diagnosed condition would require input from the provider.

If approval is not required for the modification or modifications to the existing treatment plan for one of the diagnosed conditions and it is logistically possible to make the modification or modifications, then the Yes branch is taken from step 146 to step 148 for that updated treatment plan. In step 148, the updated treatment plan with the modification or modifications is communicated from the treatment processing system 12 to the patient processing system 14. In step 158, the updated treatment plans are displayed on the display device for the patient processing system 14 for review and application by the patient, although other methods and devices for communicating the updated treatment plan or plans to the patient could be used.

If approval is required for the modification or modifications to the existing treatment plan for one of the diagnosed conditions, then the No branch is taken from step 146 to step 150. In step 150, the modification or modifications to the existing treatment plan are transmitted from the treatment processing system 12 to the provider processing system 18, although other manners and/or device for communicating the modification or modifications to the existing treatment plan can be used. In this particular embodiment, the modification or modifications to the existing treatment plan are displayed by the display device for the provider processing system 18 for review by the provider. The provider using the user input device for the provider processing system 18 can accept the modification or modifications to the existing treatment plan or can make one or more modifications to the updated treatment plan. The acceptance of or the modification or modifications to the updated treatment plan are transmitted back to the treatment processing system 12 in this particular embodiment. By way of example only, the provider may review a recommendation to prescribe a new medication for the patient to treat one of the diagnosed conditions and either accept the recommendation or change the prescription to a different medication.

Next, in step 152 a determination is made by the treatment processing system 12 on whether the modification or modifications to the updated treatment plan are in compliance with the recommended modification or modifications the modification or modifications to the existing treatment plan made earlier in steps 140 and 142, although other processing system could be used. If the modification or modifications to the updated treatment plan are in compliance with the modification or modifications to the existing treatment plan made earlier then the Yes branch is taken from step 152 to step 148 (described earlier). In step 152, the patient may simply be notified to be more compliant with the prescribed treatment plan.

If the modification or modifications to the updated treatment plan are in not compliance with the modification or modifications to the existing treatment plan made earlier then the No branch is taken from step 152 to step 154. In step 154, the providers noncompliance with the modification or modifications to the existing treatment plan recommended by the system 10 is recorded and stored in a memory storage device in the treatment processing system 12, although the

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information on non-compliance could be stored elsewhere. In optional step 156, another processing system, such as a medical facility, insurance company, or review board, may be operatively coupled to the system 10 and may access the stored information on non-compliance to evaluate the performance of different health care providers. In step 156, each patient's compliance with treatment plans can be monitored and analyzed. By way of example, non-compliant patients may be notified of their non-compliance and a physician's modifications to treatment plans may take into account patient compliance to treatment protocols.

Next, in step 158 as discussed earlier the updated treatment plans are displayed on the display device for the patient processing system 14 for review and application by the patient. Additionally, in step 158, a provider's performance over time with respect to complying with established guidelines for assessing conditions in patients and for treating conditions can be analyzed for a variety of reasons. By way of example only, a third party payer could review both patient and physician performance in the system 10, such as their clinical performance over time, compliance with established treatment guidelines/recommendations for one and for multiple patients, overall cost, pharmacy usage and overall wellness. For example, a patient finishes session and can review their clinical performance over time via graphic displays and then returns to Step 100 at the appropriate time. Additionally, another authorized agency, such as a pharmaceutical company or university could review data stored for purposes of research, post-marketing analysis, appraisal of the efficacy of a particular product or device, comparison of two or more similar treatments or devices, or to conduct clinical or field trials of new or existing devices or pharmaceuticals or other such activities consistent with their charter. Further, as discussed earlier, patient compliance with treatment plans can also be analyzed in step 158.

Referring to FIG. 5, in step 160 the treatment processing system 12 reassesses the modification or modifications to the updated treatment plan or plans and determines whether additional objective and/or subjective data is needed from the patient prior to the next regularly scheduled session. Additionally, the treatment processing system 12 queries the patient processing system 14 to determine if the patient needs other items, such as refills on medications or other medical supplies, although other manners and devices for requesting this information can be used. If other items are needed, then the treatment processing system 12 may arrange for them to be delivered to the patient. If more information is needed, then the Yes branch is taken from step 160 to step 162. In step 162, the treatment processing system 12 contacts the patient through the patient processing system 14 and request this additional objective and/or subjective data asset forth in steps 100 and 102, although other manners and devices for requesting this objective and/or subjective data can be used. If more objective and/or subjective data is not needed, then the No branch is taken from step 160 to step 164 and the treatment processing system 12 transmits a reminder to the patient processing system 14 of the date of the next session, although other manners and devices for transmitting this information can be used.

The present invention as discussed herein can be implemented on a single program general purpose computer or separate program general purpose computer. The present invention can also be implemented on a special purpose computer, a programmed microprocessor or microcontroller and peripheral integrated circuit element, an ASIC or other integrated circuit, a digital signal processor, a hard wired electronic or logic circuit such as a discrete element circuit,



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a programmable logic device such as a PLD, PLA, FPGA, PAL, or the like. In general, any device capable of implementing a finite state machine that is in turn capable of implementing the flowchart illustrated in FIGS. 2-6 can be used to implement the system 10 according to this invention.

Furthermore, the disclosed method may be readily implemented in software using object or object-oriented software development environments that provide portable source code that can be used on a variety of computer or workstation hardware platforms. Alternatively, the disclosed system may be implemented partially or fully in hardware using standard logic circuits or VLSI design. Whether software or hardware is used to implement the system in accordance with this invention is dependent on the speed and/or efficiency requirements of the system, the particular function, and the particular software or hardware systems or microprocessor or microcomputer systems being utilized. The system and methods described above, however, can be readily implemented in hardware and/or software using any known or later-developed systems or structures, devices and/or software by those skilled in the applicable art without undue experimentation from the functional description provided herein together with a general knowledge of the computer arts.

Moreover, the disclosed methods may be readily implemented as software executed on a programmed general purpose computer, a special purpose computer, a microprocessor, or the like. In this instance, the methods and systems of this invention can be implemented as a routine embedded on a personal computer, such as a Java®, CGI script or other programming languages, techniques, and/or strategies, as a resource residing on a server or graphics workstation, as a routine embedded in a dedicated computer controlled display system, a web browser, an computer controlled display for a cellular phone, a PDA, a dedicated computer controlled display system, or the like. The system can also be implemented by physically incorporating the system and method into a software and/or hardware system, such as the hardware and software systems of a dedicated computer system.

Having thus described the basic concept of the invention, it will be rather apparent to those skilled in the art that the foregoing detailed disclosure is intended to be presented by way of example only, and is not limiting. Various alterations, improvements, and modifications will occur and are intended to those skilled in the art, though not expressly stated herein. These alterations, improvements, and modifications are intended to be suggested hereby, and are within the spirit and scope of the invention. Accordingly, the invention is limited only by the following claims and equivalents thereto.

What is claimed is:

1. A method for tracking compliance with treatment guidelines, the method comprising:

determining a current assessment of one or more diagnosed conditions in a patient based on data about each of the diagnosed conditions from the patient who is at a remote location and on one or more assessment guidelines for each of the diagnosed conditions;

updating an existing treatment plan for each of the diagnosed conditions based on the existing treatment plan, the current assessment, and on one or more treatment guidelines for each of the diagnosed conditions to generate an updated treatment plan for each of the diagnosed conditions;

reviewing the updated treatment plan for each of the diagnosed conditions;

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determining if one or more changes are needed to the reviewed treatment plan for each of the diagnosed conditions;

changing the reviewed treatment plan if the one or more changes are determined to be needed;

providing the patient with the reviewed treatment plan for each of the diagnosed conditions; and

generating and providing compliance data based on the updated treatment plan and the reviewed treatment plan for each of the diagnosed conditions.

2. The method as set forth in claim 1 wherein the compliance data comprises provider information on the number of the reviewed treatment plans which are different from a corresponding one of the updated treatment plans for each provider.

3. The method as set forth in claim 1 wherein the compliance data further comprises data on patient compliance with at least one of the existing treatment plan for each diagnosed condition.

4. A system for tracking compliance in treating patients, each of the patients having one or more diagnosed conditions, the system comprising:

an assessment processing system that determines a current assessment of each of the diagnosed conditions based on data about each of the diagnosed conditions from the patient who is at a remote location and on one or more assessment guidelines for each of the diagnosed conditions;

a treatment processing system that updates an existing treatment plan for each of the diagnosed conditions based on the existing treatment plan, the current assessment, and on one or more treatment guidelines for each of the diagnosed conditions to generate an updated treatment plan for each of the diagnosed conditions;

a review system that modifies the updated treatment plan if one or more changes are determined to be needed and provides a reviewed treatment plan;

a presentation system that provides the reviewed treatment plan for each of the diagnosed conditions; and

a compliance system that generates and provides compliance data based on the reviewed treatment plan and the updated treatment plans.

5. The system as set forth in claim 4 wherein the compliance data comprises provider information on the number of the reviewed treatment plans which are different from a corresponding one of the updated treatment plans for each provider.

6. The system as set forth in claim 4 wherein the compliance data further comprises data on patient compliance with at least one of the existing treatment plan for each diagnosed condition.

7. A computer readable medium having stored thereon instructions for tracking compliance with treatment guidelines which when executed by a processor, cause the processor to perform the steps of:

determining a current assessment of one or more diagnosed conditions in a patient based on data about each of the diagnosed conditions from the patient who is at a remote location and on one or more assessment guidelines for each of the diagnosed conditions;

updating an existing treatment plan for each of the diagnosed conditions based on the existing treatment plan,

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the current assessment, and on one or more treatment guidelines for each of the diagnosed conditions to generate an updated treatment plan for each of the diagnosed conditions;  
reviewing the updated treatment plan for each of the diagnosed conditions;  
determining if one or more changes are needed to the reviewed treatment plan for each of the diagnosed conditions;  
changing the reviewed treatment plan if the one or more changes are determined to be needed;  
providing the patient with the reviewed treatment for each of the diagnosed conditions; and

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generating and providing compliance data based on the updated treatment plan and the reviewed treatment plan for each of the diagnosed conditions.

8. The medium as set forth in claim 7 wherein the compliance data comprises provider information on the number of the reviewed treatment plans which are different from a corresponding one of the updated treatment plans for each provider.

9. The medium as set forth in claim 7 wherein the compliance data further comprises data on patient compliance with at least one of the existing treatment plan for each diagnosed condition.

\* \* \* \* \*



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Stewart et al.

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(54) **NETWORK-BASED SYSTEM FOR  
DIAGNOSING BALANCE DISORDERS**

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(52) **U.S. Cl.** ..... 600/595; 600/300

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600/595

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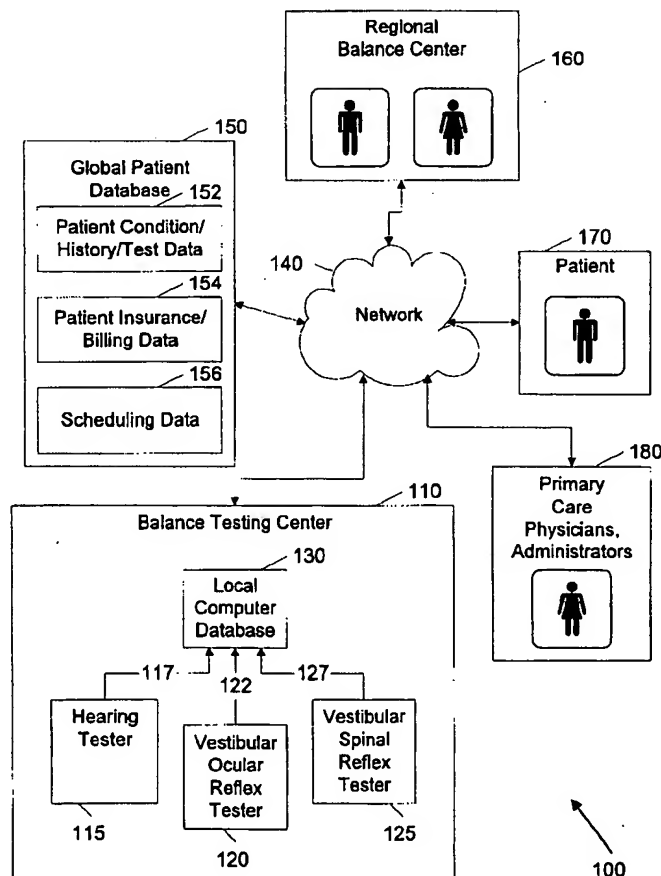
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Charles W. Hanor; Ted D. Lee

(57) **ABSTRACT**

A test administration center is provided at which a plurality of balance diagnostic tests are administered on a patient. A test evaluation center, located remotely from the test administration center, is provided at which diagnostic data is evaluated by a skilled clinician. A computer network links, and transfers data from, the test administration center to both the test evaluation center, where the data is evaluated, and to a patient database, where the data is stored.

**34 Claims, 2 Drawing Sheets**



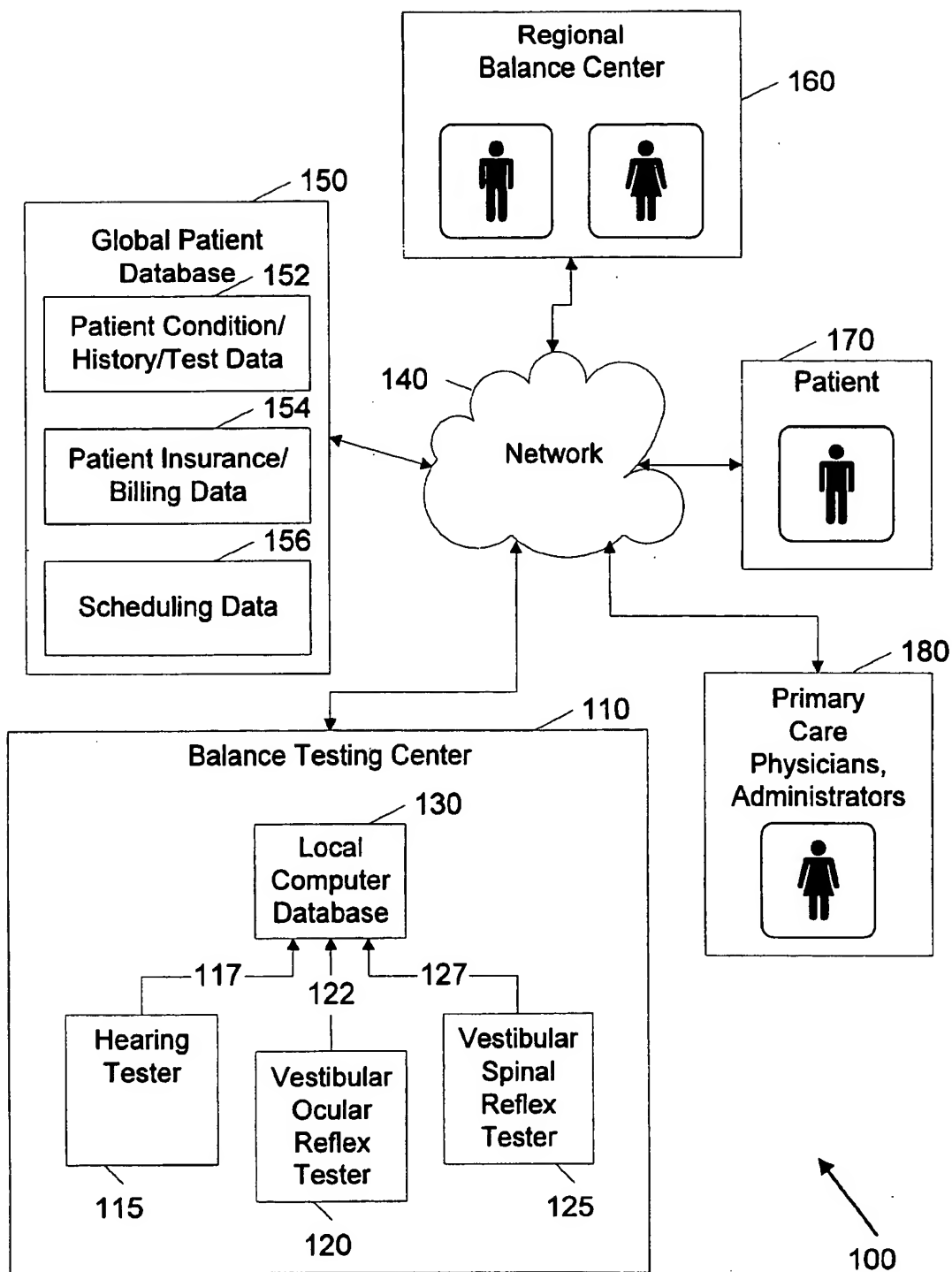


FIG. 1

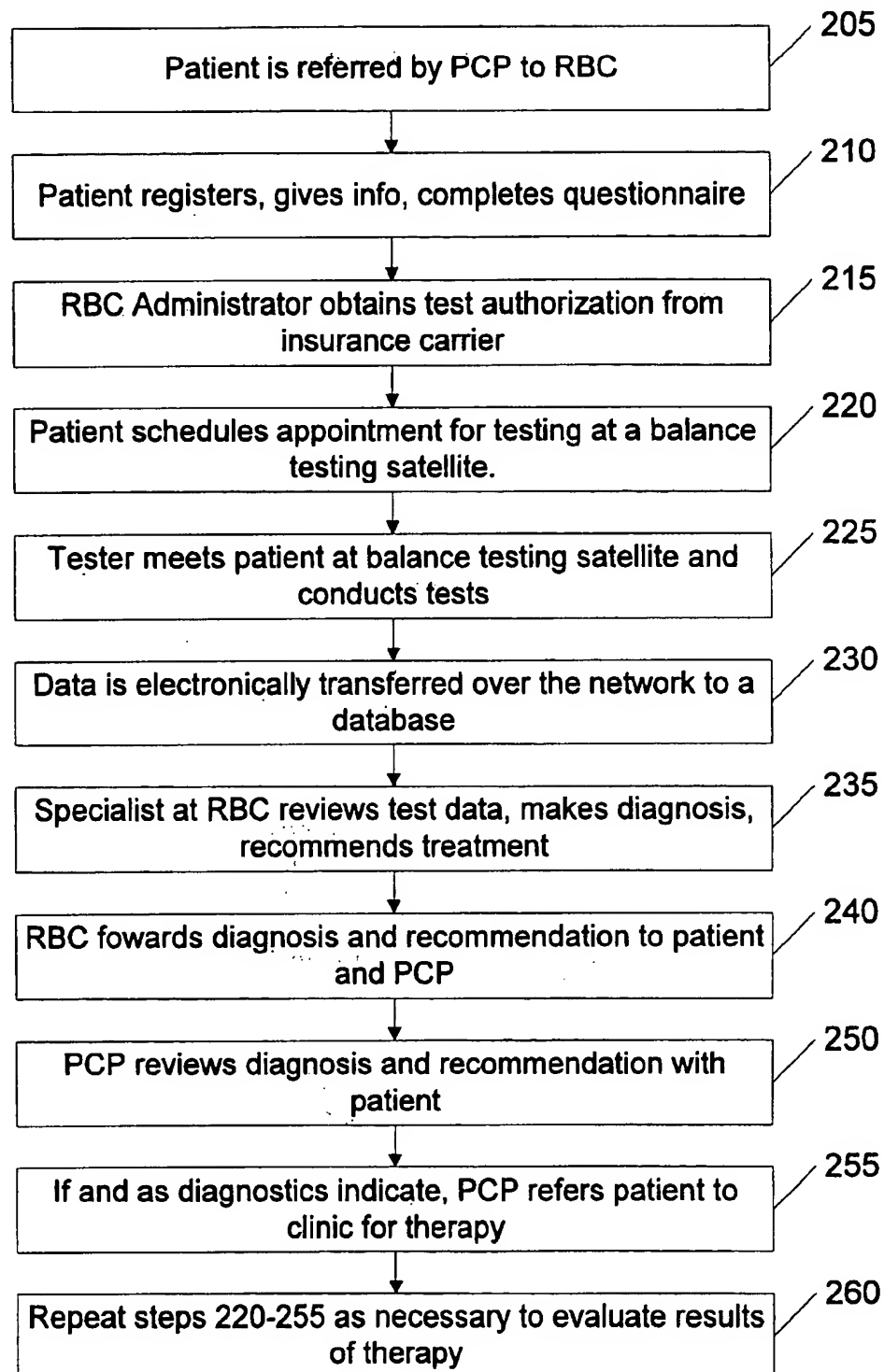


FIG. 2

## NETWORK-BASED SYSTEM FOR DIAGNOSING BALANCE DISORDERS

### FIELD OF THE INVENTION

The invention relates to the diagnosis of balance disorders, and particularly to a network-based system for remotely evaluating balance-related diagnostic test data.

### BACKGROUND

The brain maintains a sense of spatial orientation and equilibrium by integrating and interpreting a variety of different sensory inputs from the visual, vestibular (inner ear), and somatosensory (muscles, skin, and joints) systems. The most complex source of spatial cues is the vestibular system of the inner ear. Indeed, studies have shown that the vast majority of patients complaining of dizziness have a vestibular abnormality.

The inner ear has two types of spatial orientation sensors. Three endolymphatic-fluid-filled semi-circular canals provide sensory information about velocity, rotation, and angular motion. Two otolith organs in each inner ear, the utricle and the saccule, sense horizontal and vertical acceleration, respectively. Specialized hair cells in the otoliths and the ampullae (the dilated portions of the semi-circular canals) are displaced by movement in one direction or the other. These displacements are converted in neural signals, which are transmitted by the vestibular nerve to the brain. When the head is in a normal upright position, the hair cells in each ear fire equally at a static rate. When the head tilts to the right or to the left, the hair cells in each ear fire at different rates. The central nervous system recognizes the difference in the firing rate to determine where the head is in space.

The sensory data from the inner ear is complemented by visual cues from the eyes and somatosensory spatial cues from the muscles and skin, which sense pressure and muscle tensioning caused by standing, sitting, or lying down.

Sensory mismatch occurs when the various sensory inputs of the body do not agree with one another. For example, a room on a ship in a stormy sea may look upright at the same time the gravity sensors in the inner ear and pressure sensors in the feet indicate that the room is tilted at an angle. Sensory mismatch can result in nausea, queaziness, and disorientation.

Several different conditions can cause the balance system to malfunction. Labyrinthitis and Vestibular Neuronitis are conditions that describe the inflammation of the inner ear or the vestibular nerve, typically caused by a viral infection. These conditions are characterized by a sudden onset of vertigo which is "spinning" in nature, extreme nausea, and vomiting.

Endolymphatic Hydrops is a condition of the inner ear related to the inability of the ear to regulate its fluid balance, resulting in an episodic buildup of pressure within the balance and hearing organs. This disorder is characterized by spontaneous episodes of vertigo lasting up to several hours, fullness of the ear, "ringing" or noise in the ear, and/or hearing loss. When all of these symptoms are present, the disorder is described as Meniere's Disease. Endolymphatic Hydrops has many causes, including Labyrinthitis, perilymphatic fistula, concussions, noise trauma, autoimmune inner ear disease, and ear surgery. This disorder is thought to be related to herpetic group viruses. Immune stimulation from allergies, stress, illness or hormonal changes tend to worsen these symptoms.

Benign Paroxysmal Positional Spinning (BPPV) is a condition characterized by the positional onset of vertigo.

Brief episodes of vertigo may be caused by lying down, rolling over in bed, or tilting the head back to look up. Canalithiasis, a form of BPPV associated with vertigo lasting only a few seconds, is thought to be caused by misplaced calcium carbonate crystals (otoconia) that have been dislodged from the inner ear and which float freely within the semi-circular canals in response to gravity. Cupulolithiasis, a form of BPPV associated with vertigo lasting several minutes, is caused by misplaced otoconia stuck to the cupula that constantly stimulate the balance sensor.

Perilymphatic fistula is caused by a hole in the inner ear that leaks endolymphatic fluid into the middle ear. Leakage results in brief episodes of vertigo triggered by rapid changes in middle ear pressure, such as that caused by coughing, sneezing, lifting, scuba diving, head trauma, or rapid changes in altitude.

Vertebrobasilar Insufficiency (VBI) is a common vascular disorder characterized by decreased blood flow through the vertebrobasilar artery system, which can result in an abrupt onset of vertigo that resolves after several minutes of lying down. Such episodes are accompanied by other VBI symptoms, including visual hallucinations, drop attacks, visual field deficits, diplopia, and headache.

Ototoxicity is a condition characterized by damage done to the hearing and balance systems by drugs. Common medications that can permanently damage the inner ear system include Aminoglycoside antibiotics and Cisplatin. Symptoms may include gait unsteadiness, imbalance, and oscillopsia (a bouncing sensation of the horizon).

Other disorders are characterized by gravity sensors in the otolith organs being excessively responsive to internal pressure changes such as that caused by physical activity and sound. Damage can also be caused by tumors and viral infections that affect the vestibular nerve.

Vestibular abnormalities cause not only the common symptoms of dizziness, spinning, unsteadiness, and nausea, but also cognitive dysfunction, including short-term memory deficits, inability to concentrate or focus on a task, panic attacks, and depression. These cognitive symptoms are caused by the brain's natural compensation mechanisms. To suppress the sensory input from the malfunctioning ear, the brain decreases the relative function of the brain's reticular activating system (the portion of the brain responsible for "awareness" or the feeling of being "awake" or "clear") which secondarily increases the activity of the limbic system (the portion of the brain responsible for moods and emotions).

Approximately 12.5 million physician's office visits per year, or five to ten percent of all office visits, are for the complaint of dizziness. A National Institutes of Health study estimates that forty percent of the population over the age of forty have experienced or will experience a "dizziness" disorder during their lifetime. But dizziness affects the young as well. Each year over 450,000 people, mostly young adults, suffer concussions or mild head injuries. Of those requiring short-term hospitalization, a large majority complain of persistent symptoms of dizziness or memory loss.

Unfortunately, many sufferers of dizziness or vertigo disorders do not receive proper diagnosis or therapy. Because the symptoms are vague, and the possible causes multitudinous, sufferers are often improperly diagnosed. Worse, sufferers are often treated as "problem patients" or inappropriately referred to psychiatrists and neurologists.

Athletes in contact and high-impact sports experience a high incidence of vestibular abnormalities caused by mild to

severe head injuries. Unfortunately, athletes in professional and even college sports are seldom adequately diagnosed for vestibular abnormalities following a jarring collision, blow to the head, or other minor injury before being sent back onto the playing field.

There are a variety of tests for diagnosing balance disorders of the vestibular system. One test is a hearing test. Balance disorders are often accompanied by problems with hearing especially hearing of low frequencies. Another test is a posturography test, in which a person stands on a moving platform and the movement of the ankles and hips are measured. Posturography tests the vestibular-spinal reflex, which is manifested in the movements various body muscles make to maintain postural balance and coordination. Posturography is useful for detecting disorders in the otolith organs of the ear, because both the somatosensory system and the otoliths detect acceleration (including gravity).

The Vestibular Autorotational Test (VAT®) evaluates the function of the vestibulo-ocular reflex (VOR) by measuring how quickly and accurately our eyes move to compensate for head movement. The VOR allows us to have clear vision during movement. For example, when a person turns his head 30 degrees to the right, the eyes should simultaneously turn 30 degrees to the left. If the eyes turn too little or turn too much, it suggests that the vestibular system may be damaged. The vestibular ocular reflex test is useful in detecting disorders originating in, or affecting, the semi-circular canals of the ear. Sensory input from the semi-circular canals allows the brain to generate eye movements that match the velocity of the head movement.

Despite the existence of various balance dysfunction tests and many methods of treatment, balance disorder treatment is underutilized by the public at large.

#### BRIEF SUMMARY OF THE INVENTION

Various aspects of the present invention address at least some of the needs of the prior art. In one aspect, the present invention provides a system for diagnosing balance function comprising a test administration center at which a plurality of balance diagnostic tests are administered on a patient, and a remote test evaluation center at which said diagnostic data is evaluated by a skilled clinician, leading to a diagnosis of said patient. A computer network links, and transfers data from, the test administration center to both the test evaluation center, where the data is evaluated, and to a patient database, where the data is stored.

In another aspect, the present invention provides a process for diagnosing the balance system of a patient, the process comprising the steps of a primary care physician of the patient referring the patient to the balance disorder diagnostic provider, the patient registering with the provider and completing a questionnaire for the provider; the provider obtaining authorization from an insurance carrier of the patient to administer the diagnostic balance tests; the patient scheduling an appointment for a plurality of diagnostic balance tests; an affiliate of the provider administering, at the appointed time, the plurality of diagnostic balance tests on the patient using diagnostic testing machines that generate diagnostic data, said plurality of diagnostic balance tests being administered at a first location; a network transmitting the diagnostic data from said diagnostic testing machines to a patient database that stores said diagnostic data; the provider retrieving, at a second location distinct and independent from the first location, the diagnostic data from said patient database; the provider evaluating the diagnostic data

to diagnose the patient; the provider recommending therapy to improve the patient's vestibular functioning; the provider forwarding the diagnosis and recommended therapy to the primary care physician; and the primary care physician referring the patient to the clinic for therapy.

A further aspect of the present invention provides widespread access to state-of-the-art diagnostic modalities. Another aspect of the present invention provides off-site "expert" interpretation of balance dysfunction test data and expert guidance through a global network. Yet another aspect of the present invention provides a platform that integrates a plurality of diagnostic tools, transfers the associated data to a database on the global network, and provides for off-site diagnosis and customization of therapy. Further aspects of the present invention link a regional balance center, a satellite balance testing center, the primary care physician, the patient, and a database through a global computer network. Another aspect of the present invention centrally stores clinical and diagnostic information.

One of the advantages of the present invention is that it gives patients, healthcare providers, athletes, coaches, physical trainers, and others a more complete picture of how well the vestibular system is interacting with the body and brain. Another advantage is that it aids in accurate evaluation and treatment of the specific sensory abnormality by assisting the healthcare provider in distinguishing the source of the symptoms. A further advantage of the present information is that it promotes a team approach to working with patients and athletes, by coordinating athletic trainers with physicians and therapists.

A further advantage of the system and procedure of the present invention is that it provides cost-effective screening, diagnosis, and customized therapeutics for patients with vestibular based disorders. A yet further advantage is that a person seeking treatment can apply and set up an appointment for treatment from any personal computer linked to the global network.

Another advantage of the system and procedure of the present invention is that it facilitates early and aggressive vestibular therapy to minimize and compensate vestibular abnormalities. Administered early after a concussion or mild head injury, aggressive vestibular therapy helps the brain to learn to compensate for vestibular abnormalities without suppressing secondary cerebral functions. Even administered long after an injury, the present invention helps identify the abnormalities and allow customized therapy to restore cognitive abilities to normal performance.

Another advantage of the system and procedure of the present invention is enhancement of athletic performance. Even minor, subtle vestibular abnormalities, which might be tolerable to an ordinary individual performing ordinary tasks, can impair athletic performance and physical coordination, increasing the risk of further injury. Treatments of athletes in accordance with one aspect of the present invention enhances the vestibulo-ocular reflex (VOR), increasing the athlete's clarity of vision during rapid eye movement.

The benefits of the present invention redound not only to athletes and concussion sufferers, but also to the elderly and the public at large. Every year, one-third to one-half of the population over age 65 experiences falls, many of which lead to orthopedic injuries, including disabling hip fractures. Many of these falls are due to, or contributed by, underlying inner ear disorders. The present invention's system and procedure for routine and early detection of balance abnormalities significantly reduces the risk of falling for elderly patients.

Moreover, recent clinical experience suggests that some common processing disorders, such as attention deficit disorder, attention deficit hyperactivity disorder, learning disorder, central auditory processing disorder, and visual processing disorder, may merely be symptoms of an underlying inner ear abnormality. Therapeutic regimens administered in accordance with the present invention will improve, if not completely reverse, such central processing disorders.

Other aspects and advantages of the present invention will be more clearly understood after reference to the following detailed description read in conjunction with the drawings.

#### BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a block diagram of one embodiment of a system for remotely diagnosing balance disorders, built in accordance with the present invention.

FIG. 2 is a functional flow diagram of one embodiment of a process of remotely scheduling and evaluating diagnostic tests for balance disorders.

#### DETAILED DESCRIPTION

FIG. 1 is a block diagram of one embodiment of a system 100 for diagnosing balance disorders via a network. The exemplary embodiment provides a regional balance center 160 that is linked via a network 140 to a satellite balance testing center 110. The regional balance center 160 is staffed with physicians and clinicians expert at interpreting balance diagnostic data and developing therapeutic regimens to treat balance disorders. The satellite balance testing center 110 is typically an outpatient rehabilitation center staffed by physical therapists. Although not illustrated in the exemplary embodiment, a typical system 100 will have several balance testing centers 110 for every regional balance center 160, and the typical balance testing center 110 will be located remotely (i.e., at least two miles) from the nearest regional balance center 160.

The network 140 is preferably the global computer network commonly referred to as the "Internet." The network 140 is alternatively an intranet or other private network. The network 140 allows the separate steps of diagnostic testing and test result evaluation to be carried on at separate and remote locations, extending the reach of the expertise of the regional balance center 150.

A global patient database 150 is also linked with the network 140, providing remote access to patient data, including the patient's history, physical condition, and test results 152, the patient's insurance and billing data 154, and scheduling data 156. In this manner, the network 140 serves not only as a two-way channel of communication between the regional balance center 160 and the balance testing center 110, but also as a platform for accumulating, storing, and retrieving patient data. The global patient database 150 also provides empirical data from a large population of patients useful in studies evaluating various balance disorders, the accuracy of various diagnostic procedures, and the effectiveness of various therapies.

The balance testing center 110 has a plurality of balance disorder diagnostic tools, including a device 115 for testing hearing, a device 120 for testing vestibular ocular reflex, and a device 125 for testing the vestibular spinal reflex. Data from devices 115, 120, and 125 is conveyed to local computer database 130 via communication channels 117, 122, and 127. After the diagnostic data is collected by the local computer database 130, it is conveyed to the global patient database 150 or the regional balance center 160 via the

network 140. In one embodiment, the local computer database 130 is a Microsoft Access database.

The network-based system 100 for diagnosing balance disorders also provides a patient 170 with access to the network 140 and portions of the global patient database 150. This access enables the patient to register and schedule an appointment for diagnostic testing from any computer hooked up to the network 140. The system 100 further provides primary care physicians (PCPs) and health administrators (e.g., health maintenance organization administrators, third party payers) with access to the network 140. This connection facilitates PCP authorization of balance diagnosis and therapy. It also facilitates communication regarding a patient's diagnostic test results and recommended therapy regimen from the regional balance center 160 to the patient's PCP 180.

FIG. 1, of course, is an exemplary embodiment of the present invention that incorporates many features not intended to be limiting. Numerous variations, enhancements, subtractions, and substitutions could be made to components of the system 100 without departing from several of the aspects of the present invention. For example, the global patient database 150 may reside at a regional balance center 160, or different kinds of patient information could be stored at different locations. Alternatively (or in addition), the regional balance center 160 may be substituted with an individual clinician qualified to evaluate vestibular balance data from any computer terminal connected to the network 140. Similarly, the balance testing center 110 may be replaced with a portable balance testing system. Also, the balance testing center 110 could employ different vestibular diagnostic tests, or transmit the results directly to the network 140 without first being collected and organized by a test data aggregator 130 such as a database. Furthermore, access could be denied altogether to patients 170 or primary care physicians 180 without sacrificing all of the aspects of the present invention.

FIG. 2 is a functional flow diagram of an embodiment of an advanced method for diagnosing balance disorders via a network. In step 205, a primary care physician refers a patient to a regional balance center. In step 210, the patient registers, provides personal and financial information, including insurance data, and completes a questionnaire. In the exemplary embodiment, the patient is given the opportunity to perform this step completely on-line. The patient is also given a choice to print out the necessary forms so that they can be sent in by regular mail.

In step 215, an administrator at the regional balance center obtains authorization from the patient's insurance carrier to conduct the diagnostic tests. In step 220, the patient schedules an appointment for testing at a balance center. In step 225, the patient goes to a satellite balance testing center to undergo a battery of vestibular diagnostic tests, which are administered by a suitable tester such as a physical trainer or trainer's assistant. In step 230, the data is transmitted electronically over a network to a database.

In step 235, a specialist at the regional balance clinic reviews the test data, makes a diagnosis, and recommends a treatment. In step 240, the specialist's diagnosis and recommendation are forwarded to the patient's primary care physician. In step 250, the primary care physician reviews the diagnosis and recommendation with the patient. In step 255, the primary care physician refers the patient to the clinic for therapy. In step 260, steps 220 through 255 are repeated as necessary to evaluate the results of the therapy.

Many of the steps can be rearranged or reordered without detracting from many of the aspects of the present invention.



For example, step 220 could be modified slightly and collapsed into step 210, so that the patient would make a provisional appointment for testing subject to authorization by the insurance carrier. Emails could be sent later to the patient to confirm or remind the patient of the reservation.

One enhancement of the embodiment of FIG. 2 would be to precede step 205 with step 210. In that case, a patient could electronically submit a request to his or her PCP for a referral, eliminating the need to independently seek the referral. Such an enhanced process, of course, would require acceptance by the patient's insurer.

While particular embodiments of the invention have been illustrated and described, it will be obvious to those skilled in the art that various changes and modifications may be made without sacrificing the advantages provided by the methods and apparatuses disclosed herein.

What we claim is:

1. A method of administering a medical practice to diagnose and treat balance disorders, comprising:

administering a plurality of diagnostic tests to produce diagnostic test data;

storing the diagnostic test data at a first data storage facility communicatively coupled to the Internet;

accessing the Internet to retrieve the diagnostic test data from the first data storage facility;

evaluating the diagnostic test data to detect and diagnose a balance disorder;

recommending a therapeutic regimen, if needed, to treat the balance disorder;

storing an electronic form of the recommended therapeutic regimen, if any, at the first data storage facility or a second data storage facility communicatively coupled to the Internet;

accessing the Internet to retrieve the recommended therapeutic regimen, if any; and

implementing the recommended therapeutic regimen, if any.

2. The method of claim 1, wherein the diagnostic tests are administered using a portable balance testing system.

3. The method of claim 1, wherein the diagnostic tests are administered at a balance testing facility at a first location, and wherein the diagnostic test data is evaluated at a regional balance center at a second location remote from the first location.

4. The method of claim 1, further comprising providing a publicly accessible Internet site to permit a patient to register and schedule an appointment for diagnostic testing from an unspecified computer connected to the Internet.

5. The method of claim 4, further comprising providing the patient who accesses the publicly accessible Internet site to register and schedule an appointment with an online questionnaire.

6. The method of claim 5, where the questionnaire asks questions about the patient's physical condition and medical history.

7. The method of claim 5, where the questionnaire asks questions about any insurance coverage carried by the patient.

8. The method of claim 4, further comprising providing the patient with access to the recommended therapeutic regimen through the publicly accessible Internet site.

9. The method of claim 1, further comprising providing security to restrict access to persons authorized to review the diagnostic test data and recommended therapeutic regimen.

10. An integrated practice management system for diagnosing and treating balance disorders, comprising:

a plurality of balance testing satellites for administering tests to diagnose balance disorders and producing diagnostic test data;

a diagnostic center where the diagnostic test data is evaluated, a diagnosis is made, and a therapeutic regimen is recommended, the diagnostic center being located at a remote physical location from at least one of the balance testing satellites;

interfaces between each balance testing satellite and the Internet for transmitting the diagnostic test data; and

an interface between the diagnostic center and Internet for receiving the diagnostic test data and for transmitting the diagnosis and recommended therapeutic regimen.

11. The integrated practice management system of claim 10, further comprising a publicly accessible Internet site to permit a patient to register and schedule an appointment for diagnostic testing from an unspecified computer connected to the Internet.

12. The integrated practice management system of claim 10, further comprising online means to permit a patient to register and schedule an appointment with an online questionnaire.

13. The integrated practice management system of claim 12, further comprising an online questionnaire asks questions about the patient's physical condition and medical history.

14. The integrated practice management system of claim 12, further comprising an online questionnaire asks questions about the patient's health insurance provider, if any.

15. The integrated practice management system of claim 10, further comprising means for tracking billing and payment for services provided to patients.

16. The integrated practice management system of claim 10, further comprising an interface between an office of a primary care physician and the Internet to provide access to the diagnosis and recommended therapeutic regimen.

17. A system for diagnosing balance function, the system comprising:

a test administration center at which a plurality of balance diagnostic tests are administered on a patient, said diagnostic tests producing diagnostic data;

a computer network that receives said diagnostic data from said test administration center;

a patient database that stores said diagnostic data from said test administration center;

a test evaluation center where said diagnostic data is retrieved from said patient database and evaluated by a skilled clinician to produce a diagnosis for said patient;

a communicative link, through said computer network, between said regional balance center and a primary care physician of said patient, whereby said clinician can communicate said diagnosis to said primary care physician; and

a communicative link, via said computer network, to said patient, whereby said patient can register and schedule to have said plurality of diagnostic tests administered to said patient.

18. The system of claim 17, wherein said plurality of balance diagnostic tests includes a vestibular spinal reflex test.

19. The system of claim 17, wherein said plurality of balance diagnostic tests includes a vestibular ocular reflex test that evaluates eye movements in response to head movements.

20. The system of claim 17, wherein said plurality of balance diagnostic tests includes a hearing analysis.

21. The system of claim 17, wherein said plurality of balance diagnostic tests includes a vestibular spinal reflex test and a vestibular ocular reflex test.

22. The system of claim 17, wherein said plurality of balance diagnostic tests includes a vestibular spinal reflex test, a vestibular ocular reflex test, and a hearing analysis.

23. A system for diagnosing the balance system of a patient, the system comprising:

a vestibular ocular reflex test device that produces a first diagnostic data set;

a vestibular spinal reflex test device that produces a second diagnostic data set, said vestibular spinal reflex test device located in close proximity to said vestibular ocular reflex test device; and

a computer network communicatively coupling said vestibular ocular reflex test device and said vestibular spinal reflex test device with a test evaluation center located at least two miles away from said vestibular ocular reflex test device, the computer network enabling a skilled clinician at said test evaluation center to evaluate both said first and said second diagnostic data sets.

24. The system of claim 23, further comprising a patient database communicatively coupled with said computer network, the database storing said first and second diagnostic data sets.

25. The system of claim 23, further comprising a local computer database located proximate to said vestibular ocular reflex tester and said vestibular spinal reflex tester and communicatively coupled therewith, said database storing and communicating said first and second diagnostic data sets to said computer network.

26. The system of claim 24, wherein said patient database comprises patient condition data, patient history data, patient test data, patient insurance data, patient billing data, and scheduling data, which the patient, a healthcare provider or an office administrator can access from the computer network.

27. A process for diagnosing the balance system of a patient, the process comprising:

the patient scheduling an appointment for a plurality of diagnostic balance tests;

administering, at the appointed time, the plurality of diagnostic balance tests on the patient using diagnostic

testing machines that generate diagnostic data, said plurality of diagnostic balance tests being administered at a first location;

transmitting the diagnostic data from said diagnostic testing machines to a patient database that stores said diagnostic data;

retrieving, at a second location distinct and independent from the first location, the diagnostic data from said patient database; and

evaluating the diagnostic data to diagnose the patient.

28. The process of claim 27, wherein the patient uses a computer connected to a computer network to register, schedule, and verify insurance coverage for the appointment.

29. The process of claim 27, further comprising recommending therapy to improve the patient's vestibular functioning.

30. The process of claim 29, further comprising forwarding the diagnosis and recommended therapy to a primary care physician of the patient.

31. The process of claim 27, further comprising a primary care physician referring the patient to a physical therapy clinic for therapy.

32. The process of claim 27, further comprising obtaining authorization from an insurance carrier of the patient to administer the diagnostic balance tests.

33. The process of claim 27, further comprising a primary care physician referring the patient to a provider of the diagnostic balance tests.

34. The process of claim 33, further comprising:

the patient registering and scheduling with the provider and completing a questionnaire for the provider;

obtaining authorization from an insurance carrier of the patient to administer the diagnostic balance tests;

reading the diagnostics and providing a consult letter on the recommended treatment plan to improve the patient's vestibular functioning;

forwarding the diagnosis and the recommended treatment plan to the primary care physician and the patient; and the primary care physician referring the patient to the clinic for therapy when deemed appropriate.

\* \* \* \* \*



US005923018A

**United States Patent** [19][11] **Patent Number:** **5,923,018****Kameda et al.**[45] **Date of Patent:** **Jul. 13, 1999**

[54] **MEDICAL CARE SCHEDULE AND RECORD AIDING SYSTEM, MEDICAL CARE SCHEDULE AND RECORD AIDING METHOD, AND PROGRAM STORAGE DEVICE READABLE BY THE SYSTEM**

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[73] **Assignee:** Kameda Medical Information Laboratory, Japan

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[30] **Foreign Application Priority Data**

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[51] **Int. Cl.<sup>6</sup>** ..... G06F 17/00

[52] **U.S. Cl.** ..... 235/385; 235/492; 395/203

[58] **Field of Search** ..... 235/379, 380, 235/381, 383, 385, 492; 902/216; 395/202, 203

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[57] **ABSTRACT**

A medical care schedule and record aiding system is provided with: a plurality of frame definition files each storing frame definition data to define a frame of a table, in which medical care actions of various types are arranged in first rows for each type of the medical care actions and in second rows orthogonal to the first rows for each date; a plurality of cell definition files, which are set for each of the frame definition files, and each of which stores cell definition data including at least positional data, which indicates a first row and a second row of each of cells segmented by the frame of the table, among (i) the positional data, (ii) a medical care category code, which corresponds to each of cells from among a plurality of medical care category codes respectively assigned to the medical care actions of various types in advance, and (iii) text data indicating a text to be displayed in each of cells; and a master file for storing a plurality of medical care action appellation data, each of which indicates an appellation of a medical care action corresponding to respective one of the medical care category codes, in association with each of the medical care category codes; a frame selection device for selecting an arbitrary one of the frame definition files; a display data generation device for generating frame display data and cell content display data; and a display device for displaying the table on the basis of the generated display data.

**15 Claims, 9 Drawing Sheets**

	12-13 (M/TUES) 1ST DAY (C23)	12-14 (WEDS) 2ND DAY (C24)	12-15 (THUR) 3RD DAY (C25)	12-16 (FRI) 4TH DAY
RECORD	NURSING SCHEDULE			
ACTIVITY RESTRICTION (REST/EXCRETION CLEANNESS)	BED BATH PUBIC CLEAN WASH HELPER	BED BATH PUBIC CLEAN WASH HELPER	BED BATH	BED BATH
MEAL		MORNING LUNCH DINNER		ORDINARY MEAL
PRACTICE/ MONITOR	VITAL SIGN WEIGHT MEASUREMENT 30 CM MEETER MONITOR CARDIOGRAM PULSE OXYMETER	VITAL SIGN WEIGHT MEASUREMENT	VITAL SIGN WEIGHT MEASUREMENT	VITAL SIGN WEIGHT MEASUREMENT
TEST	CARDIOGRAM BREAST X RAY CPK, CPK-MB 24 HOURS FECALURIA	CARDIOGRAM BREAST X RAY CPK, CPK-MB 24 HOURS FECALURIA	CARDIOGRAM BREAST X RAY CPK, CPK-MB 24 HOURS FECALURIA	CARDIOGRAM BREAST X RAY
ORAL MEDICINE/ EXTERNAL MEDICINE		TIMELY ADMINISTRATION (C)	TIMELY ADMINISTRATION (C)	TIMELY ADMINISTRATION (C)
INJECTION	INSTILLATION	INSTILLATION	INSTILLATION	
TREATMENT	NYCTEMERSON S-CATHETERIZATION DIAPHRAGM, WRAPPING NEBULIZER, SPIRON	ALIVE EVALUATION S-CATHETERIZATION NEBULIZER SPIRON	YORAN EVALUATION NEBULIZER SPIRON	NEBULIZER SPIRON

OTHER PUBLICATIONS

Katsuhiro Ohashi, *Dairy Medical Examination by Use of Electronic Chart*, published in *Progress of Medicine*, vol.

169, No. 12, published by Medical and Dental Medicine Publishing Company, Jun. 18, 1994, pp. 1187-1190.

Ikuyo Yoshida, *Medicine is Changed by Making a Chart into Electronic One*, published in *Database System 1996*, vol. 2, No. 9, Sep. 1, 1996, pp. 68-72.

FIG. 1

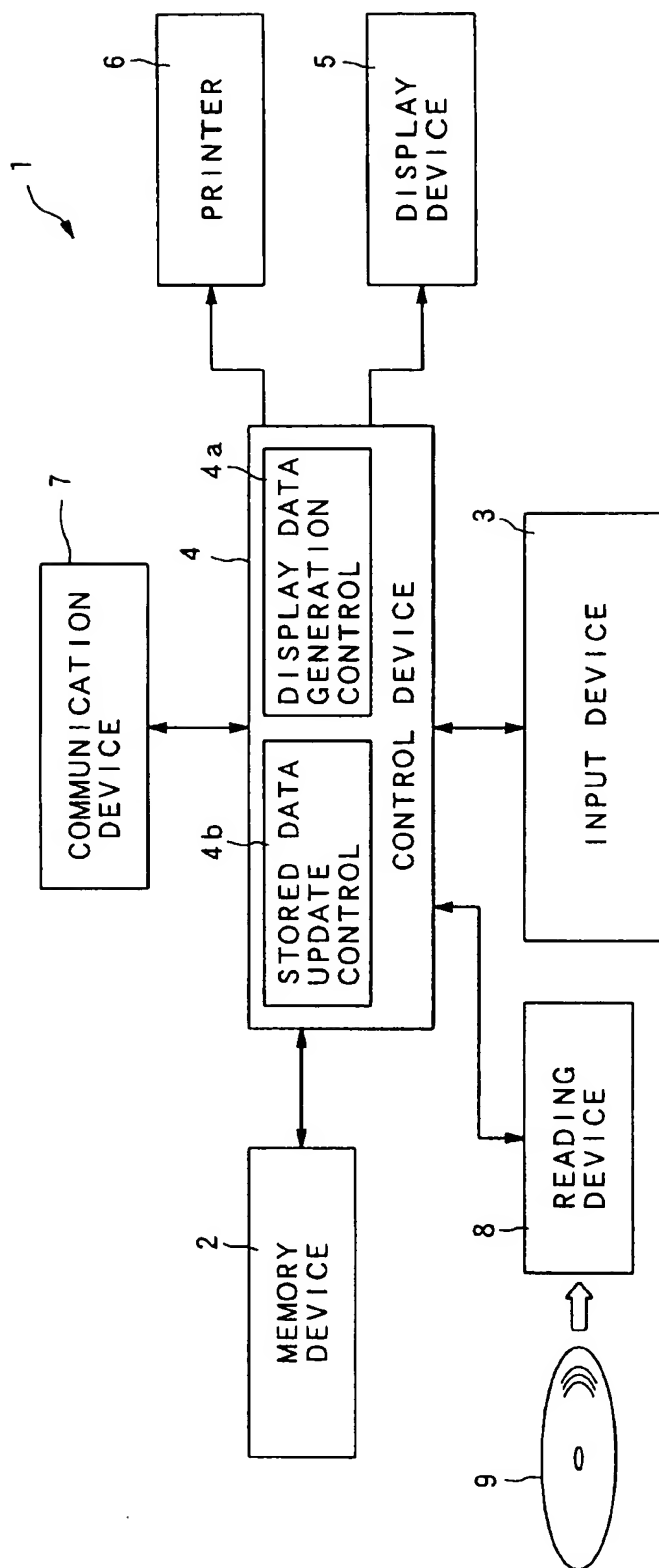


FIG. 2

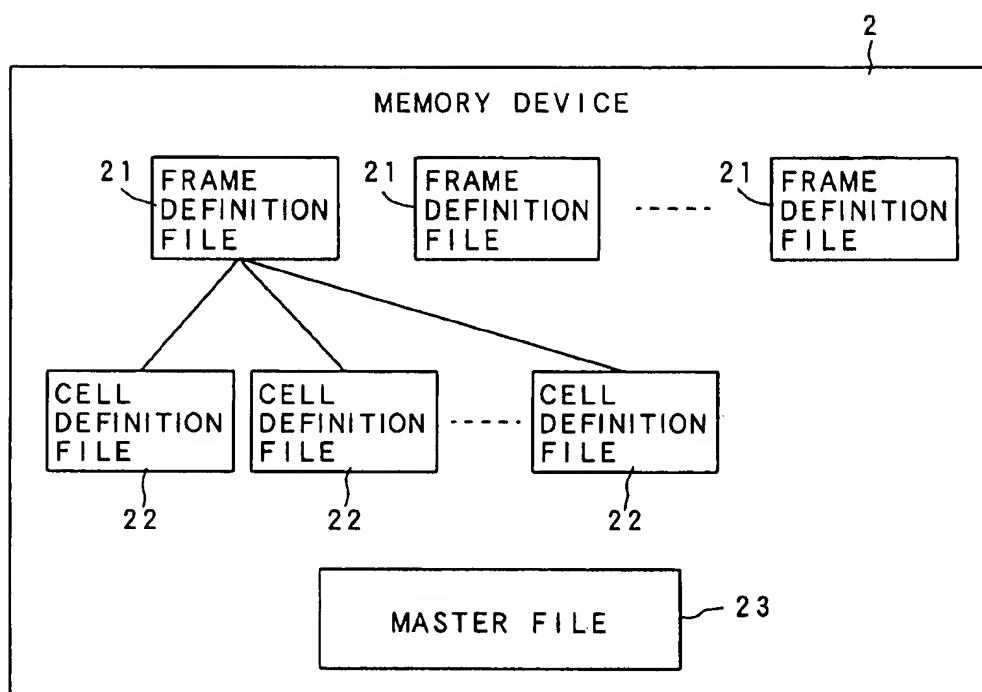
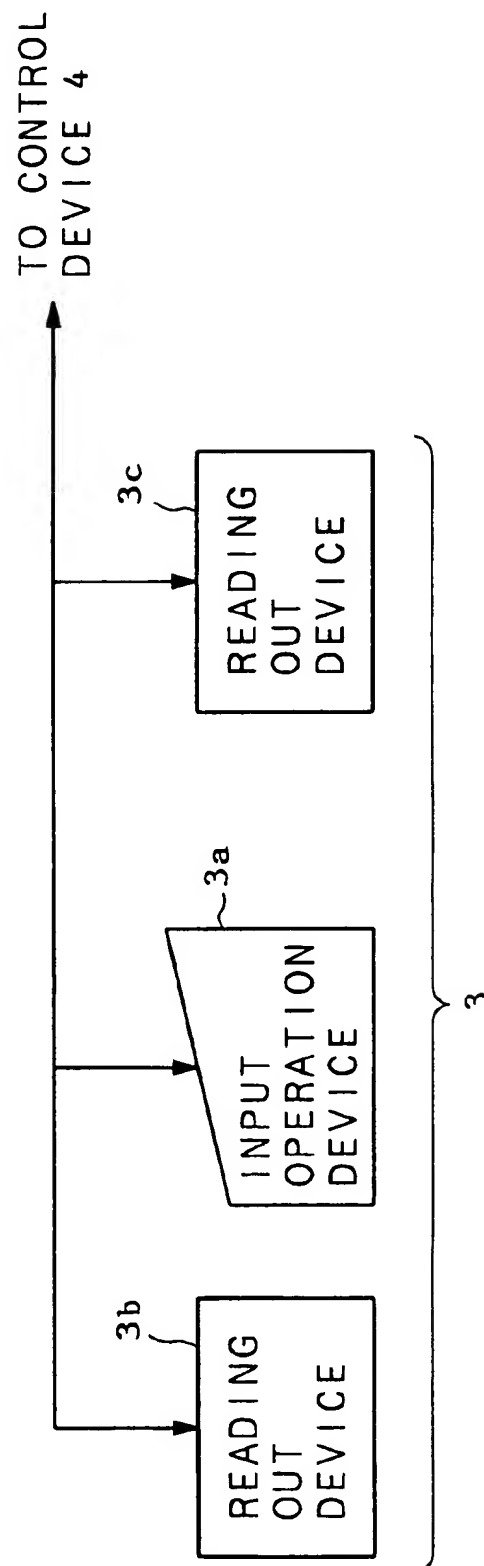





FIG. 3



12

	12-13-94(TUES) 1ST DAY(CCU)	12-14-94(WED) 2ND DAY(CCU)	12-15-94(THUR) 3RD DAY(CCU)	12-19-94(MON) 7TH DAY
RECORD	NURSING SCHEDULE	↔		↔
ACTIVITY RESTRICTION (REST/EXCRETION/ CLEANNESS)	BED BATH PUDIC CLEAN WASH HELPER	BED BATH PUDIC CLEAN WASH HELPER	BED BATH	BED BATH
MEAL		MORNING:  LUNCH:  DINNER: 		ORDINARY MEAL
PRACTICE/ MONITOR	VITAL SIGN WEIGHT MEASUREMENT SG CATHETER MONITOR CARDIOGRAM PULSE OXIMETER	VITAL SIGN WEIGHT MEASUREMENT	VITAL SIGN WEIGHT MEASUREMENT	VITAL SIGN WEIGHT MEASUREMENT
TEST	CARDIOGRAM BREAST X RAY CPK, CPK-MB 24 HOURS FECALURIA	CARDIOGRAM BREAST X RAY CPK, CPK-MB 24 HOURS FECALURIA	CARDIOGRAM BREAST X RAY CPK, CPK-MB 24 HOURS FECALURIA	CARDIOGRAM BREAST X RAY
ORAL MEDICINE/ EXTERNAL MEDICINE		TIMELY ADMINISTRATION ①	TIMELY ADMINISTRATION ①	TIMELY ADMINISTRATION ①
INJECTION	INSTILLATION	INSTILLATION	INSTILLATION	
TREATMENT	MT EVULSION S-G EVULSION DIV/DELETION, WPAPPING NEBLIZER, SPIRON	A LINE EVULSION B CATH EVULSION NEBLIZER SPIRON	Y-DRAIN EVULSION NEBLIZER SPIRON	NEBLIZER SPIRON

10

11

FIG. 4



## FIG. 5

12-09-94 (Fri)
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[HOSPITALIZATION 3rd DAY]

- ◇ DOCTOR'S RECORD
  - OPERATION/SURGERY ORDER
- ◇ EVALUATION
  - VITAL SIGN
  - WEIGHT MEASUREMENT
- ◇ MEDICATION
  - 06:00 HEPARIN 3000 UNITS DIV
  - 12:00 HEPARIN 3000 UNITS DIV
  - 18:00 HEPARIN 3000 UNITS DIV
  - 24:00 HEPARIN 3000 UNITS DIV
  - TIMELY MEDICATION
    - : INDERAL TABLET 10mg 3 TABLETS
    - POSTCIBAL MORNING LUNCH DINNER (UNTIL 12. 12)
- ◇ TEST
  - URINE GENERAL TEST
  - URINE CHEMICAL TEST: CCr
  - BLOOD SUGAR BURDEN TEST: TRETMENT
  - 15:30 CC-T (RESERVATION AT HOSPITALIZATION)
  - PM oncall CAROTID ECHO (RESERVATION AT HOSPITALIZATION)
- ◇ MEAL
  - MEAL INDICATION
    - : CARDIAC NORMAL FOOD 1600Ca | NaC15g
- ◇ REST/EXCRETION/CLEANNESS
  - SHOWER

FIG. 6

	12-07-94 (Wed) UPON HOSPITALIZING	12-08-94 (Thur) 2nd DAY OF HOSPITALIZING
MEAL	CARDIAC NORMAL FOOD	CARDIAC NORMAL FOOD
TEST	3 KINDS CULTURE	9:00 CARDIOGRAM 10:00 BREAST X RAY 12:00 ANTIBODY TEST 15:00 IMA ECHO

FIG. 7

30

	12-15-94 (Thur)				12-16-94 (Fri)			
	AM 0~	AM 6~	PM 0~	PM 6~	AM 0~	AM 6~	PM 0~	PM 6~
INJECTION		10:00 INSTILLATION	16:00 INSTILLATION					
PROCESS		11:00 MT EVULSION				9:00 NEBLIZER 10:00 SPIRON	15:00 SPIRON	

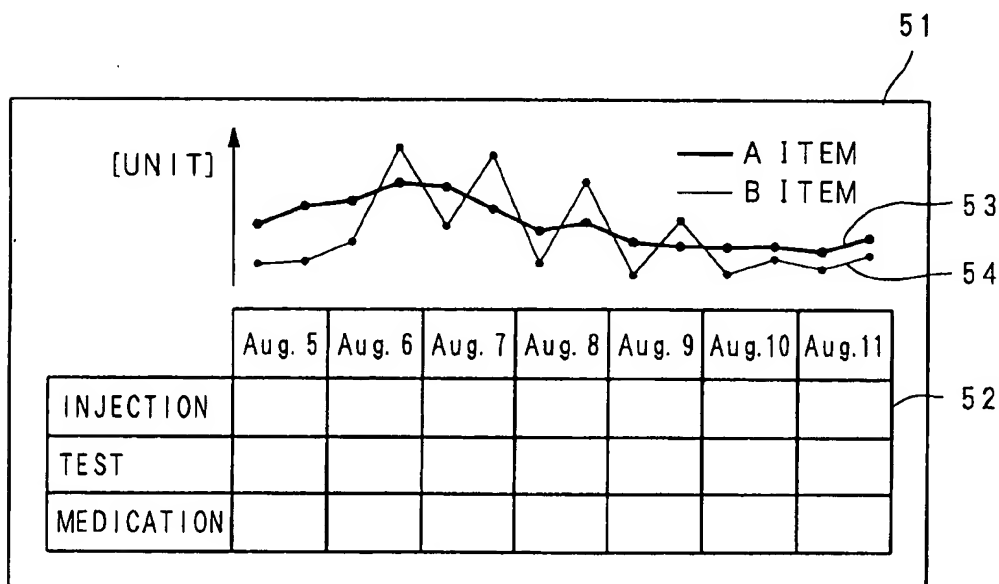
FIG. 8

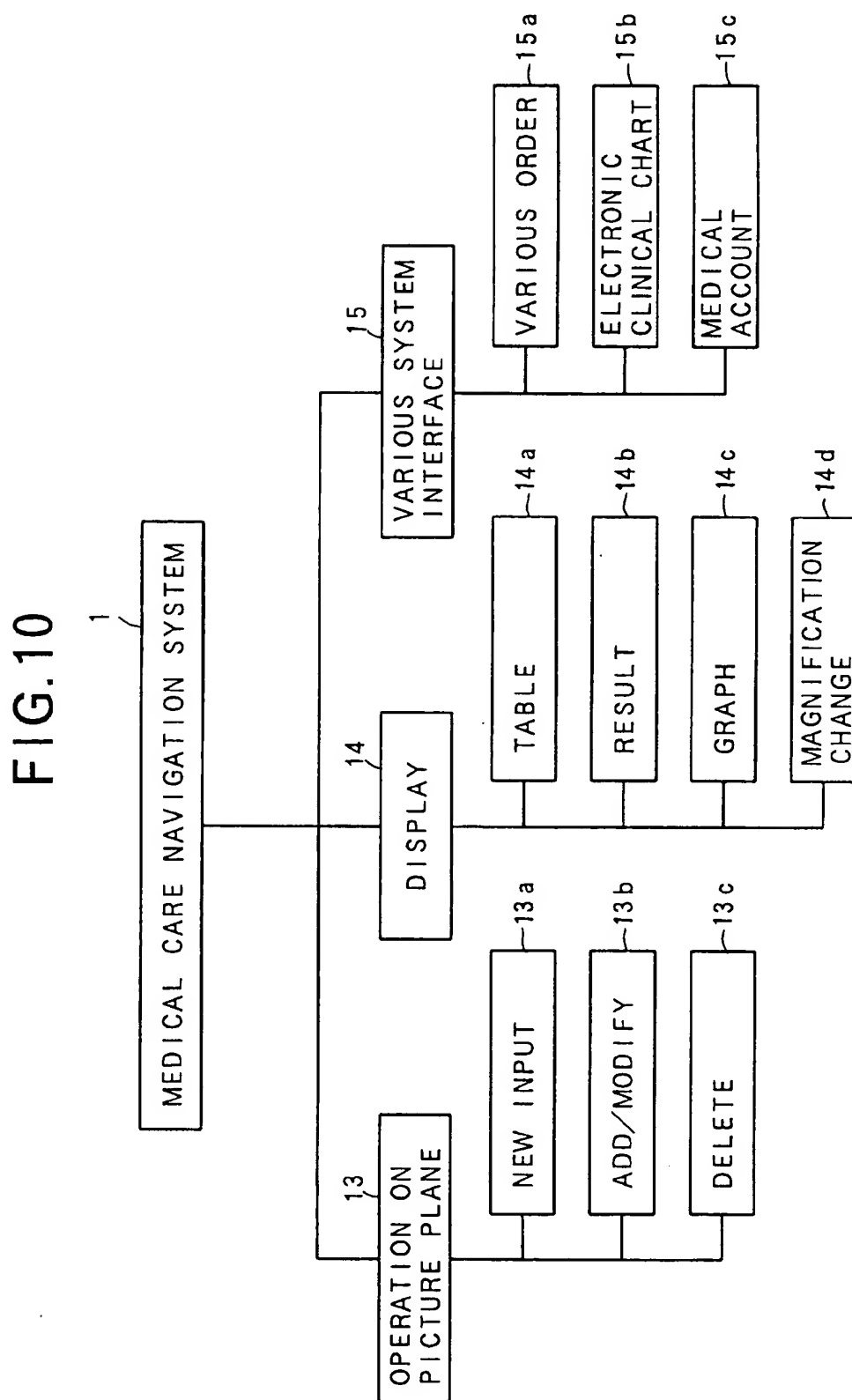
40

	'95 March 2 MONTHS LEAVING HOSPITAL	'95 April 3 MONTHS LEAVING HOSPITAL	'95 May 4 MONTHS LEAVING HOSPITAL
MEDICATION	TIMELY MEDICATION	TIMELY MEDICATION	
TEST	March 4th CARDIOGRAM March 18th CARDIOGRAM	April 15th CARDIOGRAM	May 15th CARDIOGRAM

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FIG. 9





# MEDICAL CARE SCHEDULE AND RECORD AIDING SYSTEM, MEDICAL CARE SCHEDULE AND RECORD AIDING METHOD, AND PROGRAM STORAGE DEVICE READABLE BY THE SYSTEM

## BACKGROUND OF THE INVENTION

### 1. Field of the Invention

The present invention generally relates to a technical field of managing, storing, processing, inputting and outputting the medical care information, and more particularly to a technical field of a new system for aiding or navigating a person related to medical care such as a medical doctor, a nurse, a pharmacist, a medical office worker and so on, to make up a better medical care schedule and record.

### 2. Description of the Related Art

Conventionally, each medical doctor, nurse, etc. makes up the medical care schedule as for medical care actions such as a test, an examination, an inspection, a reservation for hospitalizing, an operation, a medication and so on, by thinking and summarizing it in his or her mind on the basis of his or her experience and sense. For example, a medical doctor may make it up by writing, on a so-called "instruction table" sheet for exclusive use, the medical care schedule or plan for a certain patient such as the schedule and content of the test and the medication, the schedule and content of the medical operation, the schedule and content of the post-operation treatment or examination and so on. In such a case, it is general that a standard date for the medical care schedule, such as a date two days before the medical operation, the date of hospitalization or the like, is written on this instruction table sheet by the medical doctor. Therefore, a better medical care schedule can be made up by a well trained medical doctor etc., who thinks it carefully.

On the other hand, as a system for processing medical information by use of a computer, there is a computer system for medical office work, to which data indicating types of medical examination, medication, medical insurance, etc. are inputted and which speedily calculates the medical reward out of those inputted data and outputs a bill. Under the development of the computer communication technique nowadays, an order system is also proposed which quickly transmits the computer readable information in place of a paper chit on which the message is written, from one terminal device at one department to the other terminal device at the other department so as to speed up the preparation of the medicine, the account and the like.

Since the medical care schedule is related to a human life and thus very important, it is desirable to standardize the medical care schedule to some extent and keeps its quality high regardless of the discretion or skill of the individual doctor.

However, first of all, the aforementioned medical care schedule, which is made up by each doctor, nurse, etc., needs a work to summarize it in his or her mind in such a way as "the prescription will be performed on X day, the test will be performed on Y day, . . ." for example, which basically cannot function as a schedule table related to the medical care actions or processes. And, above all, this kind of conventional medical care schedule depends very much upon the individual discretion and skill of each doctor, nurse, etc., so that it is almost impossible to schedule and program the medical care processes which are the objectively best in case of serving various medical care actions and processes with respect to numbers of patients who have various kinds of chronic and disease, under the complication

and the high development of the medical technique nowadays. As a result, there is a serious problem that a less effective medical treatment may be applied by an erroneous judgment of the doctor, the nurse, the pharmacist or the like, and that the chronic or disease, which would have been cured by applying the most suitable treatment, is not finally cured.

On the other hand, according to the aforementioned method of manually writing the medical care schedule on the "instruction table" sheet for exclusive use, it is very inconvenient to change the schedule or plan at the presence of an emergent hospitalization of another patient, or in case of changing the future schedule on the basis of the results of some test or examination, for example.

Further, the quality itself of the medical care can be hardly improved by the aforementioned computer system for the medical office work and the order system, although the burden on the office works and the waiting time of the patients can be reduced by those systems.

## SUMMARY OF THE INVENTION

It is therefore an object of the present invention to provide a medical care schedule and record aiding system, a medical care schedule and record aiding method and a program storage device readable by the system, which can aid or navigate the staff related to the medical care to make up an appropriate and objective medical care schedule and record toward the best medical care for each patient.

The above object of the present invention can be achieved by a medical care schedule and record aiding system provided with: a plurality of frame definition files each storing frame definition data to define a frame of a table, in which medical care actions of various types are arranged in first rows for each type of the medical care actions and in second rows orthogonal to the first rows for each date; a plurality of cell definition files, which are set for each of the frame definition files, and each of which stores cell definition data including at least positional data, which indicates a first row and a second row of each of cells segmented by the frame of the table, among (i) the positional data, (ii) a medical care category code, which corresponds to each of cells from among a plurality of medical care category codes respectively assigned to the medical care actions of various types in advance, and (iii) text data indicating a text to be displayed in each of cells; a master file for storing a plurality of medical care action appellation data, each of which indicates an appellation of a medical care action corresponding to respective one of the medical care category codes, in association with each of the medical care category codes; a frame selection device for selecting an arbitrary one of the frame definition files; a display data generation device for (i) generating frame display data to display the frame of the table on the basis of the frame definition data stored in the selected frame definition file, (ii) specifying each cell corresponding to respective one of the cell definition files on the basis of the positional data in the cell definition data stored in each of the cell definition files set for the selected frame definition file, (iii) developing the medical care category code, which is included in the stored cell definition data, to the medical care action appellation data, which correspond to the medical care category code to be developed, with referring to the master file, and (iv) generating cell content display data to be displayed in the specified each cell on the basis of the developed medical care action appellation data and the text data; a display device for displaying the table on the basis of the generated frame display data and the

generated cell content display data; a cell selection device for selecting an arbitrary one of the cells constructing the displayed table; an input device for newly inputting, adding, changing, modifying or deleting the cell content display data on the display device as for the cell selected by the cell selection device; and an update device for updating the cell definition file specified on the basis of the positional data of the selected cell, when the cell content display data is newly inputted, added, changed, modified or deleted by the input device, in correspondence with the newly inputted, added, changed, modified or deleted cell content display data.

According to the system of the present invention, each of the frame definition files stores the frame definition data to define the frame of the table, in which medical care actions of various types are arranged in first rows for each type of the medical care actions and in second rows orthogonal to the first rows for each date. Here, the "date" indicates a date in the past when each medical care action has been performed, and a date in the future when each medical care action is scheduled to be performed. The "frame definition data" are defined as data, which are required to define the frame such as a size of the frame, an item name of the frame, a font for use in the display, a size of the font, text data indicating a text of comment and so on. Then, with respect to each of the frame definition files, a plurality of cell definition files are set. Each of the cell definition files stores cell definition data including at least the positional data, among the positional data, the medical care category code and the text data. Here, the "cell definition data" are defined as data, which are required to define the content to be displayed within each cell, including the positional data indicating the line and column of each cell, the medical care category code corresponding to each cell, the text data indicating the comment in text to be displayed within each cell and so on. The master file stores the medical care action appellation data indicating the appellation of the medical care action corresponding to respective one of the medical care category codes, in association with each of the medical care category codes.

In operation, at first, an arbitrary one of the frame definition files is selected through the frame selection device by an operation of an operator, such as a medical doctor, a nurse or the like. Then, by the display data generation device, the frame display data to display the frame of the table is generated on the basis of the frame definition data stored in the selected frame definition file. Along with this, by the display data generation device, each cell corresponding to respective one of the cell definition files is specified on the basis of the positional data in the cell definition data stored in each of the cell definition files set for the selected frame definition file. Then, the medical care category code, which is included in the stored cell definition data, is developed to the medical care action appellation data, which correspond to the medical care category code to be developed, with referring to the master file, and the cell content display data to be displayed in the specified each cell is generated on the basis of the developed medical care action appellation data and the text data, by the display data generation device. Then, on the basis of the generated frame display data and the generated cell content display data, the table is displayed by the display device. Next, an arbitrary one of the cells constructing the displayed table is selected through the cell selection device by an operation of the operator, such as the doctor, the nurse or the like. Then, the cell content display data is newly inputted, added, changed, modified or deleted on the display device as for the cell selected by the cell selection device, through the input device by an operation of

the operator. In this manner, when the cell content display data is newly inputted, added, changed, modified or deleted by the input device, the cell definition file specified on the basis of the positional data of the selected cell is updated by the update device in correspondence with the newly inputted, added, changed, modified or deleted cell content display data.

Consequently, according to the system of the present invention, it is very convenient to refer to or input the table in which the medical care actions are arranged for each type and for each date. Further, since the table can be displayed by a desired format, the table suitable for the usage circumstance or usage object of the respective system can be displayed or printed as the occasion demands. Particularly, by simple and clear input operations e.g., newly inputting, adding, changing, modifying and deleting the data on the display device by use of the input device, the data storage content of the cell definition file or the frame definition file can be updated, which is very convenient.

In one aspect of the system of the present invention, frame title data indicating a unique title is appended to each of the frame definition files. And that, the frame selection device selects one of the frame definition files, which has a desired frame title, by searching the frame title data.

According to this aspect, the frame title data indicating a unique title is appended to each of the frame definition files. Here, as the "frame title", such a title as indicating that the pertinent frame is suitable for a specific disease, such as "schedule table for cancer", "schedule table for Alzheimer's disease" and so on, is given. Therefore, at the time of newly composing a medical care schedule and record table, it is possible to search and select one of the frame definition files, which has a desired frame title by an operation of the operator.

Consequently, it is possible to make the best use of the case data in the past etc. for the medical care schedule and record table.

In another aspect of the system of the present invention, the input device is constructed to append patient identification data, which indicate arbitrary one of a plurality of patients, to the frame definition file selected by the frame selection device. And that, the frame selection device selects one of the frame definition files for a desired patient by searching the patient identification data.

According to this aspect, the patient identification data, which indicate arbitrary one of a plurality of patients, are appended to the frame definition file selected by the frame selection device, through the input device by an operation of the operator. Therefore, at the time of referring to or re-writing the medical care schedule and record table for the pertinent patient later on, one of the frame definition files, which is related to a desired patient, can be searched and selected by an operation of the operator.

Consequently, it is possible to display the medical care schedule and record table as for the desired patient speedily even in case of coping with a great number of patients.

In another aspect of the system of the present invention, the display data generation device generates menu display data to display a menu of candidacies for newly inputting, adding, changing or modifying the cell content display data when the cell is selected by the cell selection device. And that, the input device is constructed to newly input, add, modify or change the cell content display data on the menu based on the generated menu display data and displayed on the display device.

According to this aspect, when the cell is selected by the cell selection device, the menu of candidacies for newly

inputting, adding, changing or modifying the cell content display data is displayed on the display device. Here, as the menu display, a list of the medical care actions which have possibilities to be newly inputted, added, changed or modified according to the category of the medical care actions corresponding to the pertinent cell for example. Therefore, the cell content display data can be newly inputted, added, changed or modified on the menu display through the input device by an operation of the operator.

Consequently, it is possible to perform a speedy data editing operation, by newly inputting, adding, changing or modifying the data through the input device by an operation of the operator on the menu display.

In addition, without displaying this type of menu of candidacies, the system may be constructed such that the medical care category code or the text data are inputted through the input device such as the key board or the like. Here especially, in case that the medical care action appellation is inputted by use of the text data, the inputted text data are preferably converted to the medical care category code with referring to the master file so as to update the cell content display data.

In another aspect of the system of the present invention, the medical care category code comprises a computer code indicating each item chargeable by a medical insurance. The system is further provided with a calculation device for calculating a medical care insurance point for each cell on the basis of the medical care category code, which has been newly inputted, added, changed, modified or deleted, each time when the medical care category code is newly inputted, added, changed, modified or deleted by the input device, and to output medical care insurance point data. The cell definition file stores the cell definition data further including the medical care insurance point data. And that, the display data generation device generates the cell content display data on the basis of the medical care insurance point data in addition to the developed medical care action appellation data and the text data.

According to this aspect, each time when the medical care category code (e.g. the computer code) is newly inputted, added, changed, modified or deleted through the input device by an operation of the operator, the medical care insurance point for each cell is calculated on the basis of the medical care category code, which has been newly inputted, added, changed, modified or deleted, and is outputted as the medical care insurance point data, by the calculation device. Then, the cell definition data further including the medical care insurance point data are stored in the cell definition file. Further, on the basis of the medical care insurance point data, the cell content display data are generated by the display data generation device, so that the medical care insurance point data are displayed in each cell of the table displayed by the display device.

Consequently, it is very convenient when calculating or evaluating the medical care insurance reward.

In another aspect of the system of the present invention, the input device is constructed to specify at least one of the cells in the displayed table as a display object. And that, the display data generation device generates display data to display the cell definition data, which are related to the cell specified as the display object, in a format different from the table.

According to this aspect, at least one of the cells in the displayed table is selected as a display object, by an operation of the operator. Then, the cell definition data, which are related to this cell specified as the display object, are

displayed in the format different from the table. Here, as the display in this different format, there are display in a list of the cell definition data related to the specified cell, a display of a magnified cell and the like, for example.

Consequently, the medical care action appellation data of various types or its detail medical care data can be displayed in a display form suitable for the respective data.

In another aspect of the system of the present invention, the input device is constructed to change the frame definition data as for the frame definition file selected by the frame selection device. And that, the display data generation device makes from a font at least one portion of display data for filling each of the cells in the table while setting a size of the font in harmonization with the size of each cell determined by the frame defined by the frame definition data, which has been changed by the input device.

According to this aspect, when the frame definition data are changed through the input device by an operation of the operator, by the display data generation device, the size of the font making the display data for filling each cell of the table is set in harmonization with the size of each cell determined by the frame defined by the frame definition data, which has been changed by the input device. As a result, the font having the size harmonized with the size of each frame of the table is always displayed by the display device.

Consequently, the table filled with the font suitable for the size of each frame can be always displayed, so that it is very easy and comfortable to watch and recognize the table.

In another aspect of the system of the present invention, the system further comprises a counter for counting the date. And that, the display data generation device generates at least one of the cell content display data and the frame display data such that one portion of graphical output related to the date corresponding to a present day is displayed in a display manner different from that of the other portion of graphical output, on the basis of the date counted by the counter.

According to this aspect of the system, the date is counted by the counter, and at least one of the cell content display data and the frame display data are generated by the display data generation device such that one portion of graphical output related to the date corresponding to a present day is displayed in a display manner different from that of the other portion of graphical output, on the basis of the date counted by the counter. Here, the different display manner may be such a display manner that the color, the brightness, the styles, the kind of lines, the concentration, the half tone meshing etc. are changed on the displayed image. Consequently, the table in which one portion of graphical output corresponding to the present day is displayed in the different display manner is outputted by the outputting device. Thus, it is possible to visually recognize at a moment notice where is the present day i.e., up to which date the medical care treatment has been performed at the present time in the table in which the items are arranged for each date.

In another aspect of the system of the present invention, a result flag, which indicates whether or not the medical care action indicated by each of the medical care category codes has been already performed, is appended to each of the medical care category codes. And that, the display data generation device generates at least one of the cell content display data and the frame display data such that one portion of graphical output related to the medical care action which has been already performed is displayed in a display manner



different from that of another portion of graphical output related to the medical care action which has not been performed yet, on the basis of the result flag.

According to this aspect of the system, at least one of the cell content display data and the frame display data are generated by the display data generation device on the basis of the result flag such that one portion of graphical output related to the medical care action which has been already performed is displayed in a display manner different from that of another portion of graphical output related to the medical care action which has not been performed yet. Consequently, the table, by which it is possible to visually recognize at a moment notice whether or not each medical care action has been performed, can be graphically outputted by the display device. Further, it is also possible to visually recognize whether or not the detail medical data indicating the result of the medical care action exist logically under the medical care action appellation data, which is very convenient.

In another aspect of the system of the present invention, at least some of the medical care category codes are appended with time data indicating time of the day in addition to the date. And that, the display data generation device generates the cell content display data such that the at least some of the medical care category codes are arranged per each time of the day in each cell of the table, on the basis of the time data.

According to this aspect of the system, as for at least some of the medical care category codes to which the time data are appended, the medical care category codes are arranged per each time of the day in each cell of the table, on the basis of the time data.

Consequently, it is possible to promptly recognize the arrangement in time sequence of the medical care actions on each day, which is very convenient.

In another aspect of the system of the present invention, the cell definition data further include detail medical care data related to the medical care action indicated by respective one of the medical category codes. The input device is constructed to specify a desirable medical care action appellation among from the medical care action appellations displayed in the table by the display device. The display data generation device further generates display data to display the detail medical care data related to the medical care action appellation, which has been specified by the input device, in a predetermined format different from the table, on the basis of the detail medical care data. And that, the display device displays the generated display data in the format different from the table.

According to this aspect of the system, when a desired medical care action appellation data are inputted through the input device from among the medical care action appellation data displayed as the table, by an operation of the operator, the detail medical care data related to the specified medical care action appellation data are displayed in the predetermined format different from the table. In this case, as the format, there are a list, a graph, a chart and the like. The whole of the detail medical care data may be stored in the cell definition file. Alternatively, a specific address in an exclusive file for storing the detail medical care data may be stored as a pointer in the cell definition file, and the detail medical care data may be read out by accessing the address.

Consequently, the various information can be treated on the picture plane of the display device having the limited size, which is convenient.

In this aspect, the detail medical care data may include numerical data, which are related to a predetermined type of

the medical care action, which is indicated by the respective one of the medical care category codes, and are recorded with respect to a plurality of dates. The display data generation device generates one display data to graphically output the table at one portion of an output image and generates another display data to graphically output the numerical data as a graph having a time axis corresponding to an arrangement of the dates of the table at another portion of the output image on the basis of the numerical data. And that, the display device displays the generated one and another display data.

According to this case, the display data to graphically output the table at one portion of an output image and another display data to graphically output the numerical data as a graph having a time axis corresponding to the arrangement of the dates of the table at another portion of the output image are generated on the basis of the numerical data, by the display data generation device. As a result, the table is displayed at one portion of the output image, while the graph having the time axis corresponding to the arrangement of the dates of the table is displayed at another portion of the output image.

Consequently, it is possible to visually recognize the relationship between the medical care actions, which have been performed, and the numerical data indicating the condition etc. of the body of the patient, which is very convenient.

In another aspect of the system of the present invention, the system is further provided with a communication device connectable to another medical care schedule and record aiding system through a predetermined communication path, for transmitting and receiving at least the cell definition data.

According to this aspect of the system, at least the cell definition data are transmitted and received through a predetermined communication path by the communication device, so that the cell definition data can be shared or commonly used by a plurality of medical care schedule and record aiding systems.

The above object of the present invention can be also achieved by a medical care schedule and record aiding method in the above described medical care schedule and record aiding system of the present invention. The method is provided with: a frame selection process of selecting an arbitrary one of the frame definition files; a display data generation process of (i) generating frame display data to display the frame of the table on the basis of the frame definition data stored in the selected frame definition file, (ii) specifying each cell corresponding to respective one of the cell definition files on the basis of the positional data in the cell definition data stored in each of the cell definition files set for the selected frame definition file, (iii) developing the medical care category code, which is included in the stored cell definition data, to the medical care action appellation data, which correspond to the medical care category code to be developed, with referring to the master file, and (iv) generating cell content display data to be displayed in the specified each cell on the basis of the developed medical care action appellation data and the text data; a display process of displaying the table on the display device on the basis of the generated frame display data and the generated cell content display data; a cell selection process of selecting an arbitrary one of the cells constructing the displayed table; an input process of newly inputting, adding, changing, modifying or deleting the cell content display data on the display device as for the cell selected by the cell selection process; and an update process of updating the cell definition

file specified on the basis of the positional data of the selected cell, when the cell content display data is newly inputted, added, changed, modified or deleted by the input process, in correspondence with the newly inputted, added, changed, modified or deleted cell content display data.

According to the method of the present invention, in the same manner as the aforementioned system of the present invention, it is very convenient to refer to or input the table in which the medical care actions are arranged for each type and for each date. Further, the table suitable for the usage circumstance or usage object of the respective system can be displayed or printed as the occasion demands. Particularly, by simple and clear input operations e.g., newly inputting, adding, changing, modifying and deleting the data on the display device by use of the input device, the data storage content of the cell definition file or the frame definition file can be updated.

The above object of the present invention can be also achieved by a program storage device readable by the above described medical care schedule and record aiding system, tangibly embodying a program of instructions executable by the medical care schedule and record aiding system to perform method processes for aiding a preparation of medical care schedule and record. The method processes are provided with the processes of: a frame selection process of selecting an arbitrary one of the frame definition files; a display data generation process of (i) generating frame display data to display the frame of the table on the basis of the frame definition data stored in the selected frame definition file, (ii) specifying each cell corresponding to respective one of the cell definition files on the basis of the positional data in the cell definition data stored in each of the cell definition files set for the selected frame definition file, (iii) developing the medical care category code, which is included in the stored cell definition data, to the medical care action appellation data, which correspond to the medical care category code to be developed, with referring to the master file, and (iv) generating cell content display data to be displayed in the specified each cell on the basis of the developed medical care action appellation data and the text data; a display process of displaying the table on the display device on the basis of the generated frame display data and the generated cell content display data; a cell selection process of selecting an arbitrary one of the cells constructing the displayed table; an input process of newly inputting, adding, changing, modifying or deleting the cell content display data on the display device as for the cell selected by the cell selection process; and an update process of updating the cell definition file specified on the basis of the positional data of the selected cell, when the cell content display data is newly inputted, added, changed, modified or deleted by the input process, in correspondence with the newly inputted, added, changed, modified or deleted cell content display data.

According to the program storage device, such as a CD-ROM, a ROM, a DVD (Digital Video or Versatile Disk), a floppy disk or the like, of the present invention, the above described method of the present invention can be performed as the system reads and executes the program of instructions.

The nature, utility, and further features of this invention will be more clearly apparent from the following detailed description with respect to preferred embodiments of the invention when read in conjunction with the accompanying drawings briefly described below.

#### BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a block diagram of a medical care navigation system as an embodiment of the present invention;

FIG. 2 is a diagram showing a file structure constituted in the memory device of the embodiment;

FIG. 3 is a block diagram showing a detailed construction of an input device of the embodiment;

FIG. 4 is a plan view showing one example of a table which is graphically outputted by the embodiment;

FIG. 5 is a plan view showing one example of a list which is graphically outputted by the embodiment;

FIG. 6 is a plan view showing another example of a table which is graphically outputted by the embodiment;

FIG. 7 is a plan view showing another example of a table which is graphically outputted by the embodiment;

FIG. 8 is a plan view showing another example of a table which is graphically outputted by the embodiment;

FIG. 9 is a plan view showing another example of a table which is graphically outputted by the embodiment; and

FIG. 10 is a diagram showing functions of the medical care navigation system of the embodiment.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the accompanying drawings, an embodiment of the present invention will be now explained.

FIG. 1 shows a block diagram of a medical care navigation system for navigating the staffs in the hospital e.g. the doctor, the nurse, the pharmacist and the like to the appropriate medical care, as an example of the medical care schedule and record aiding system of an embodiment of the present invention.

In FIG. 1, a medical care navigation system 1 is provided with: a memory device 2; an input device 3; a control device 4; a display device 5; a printer 6; and a communication device 7.

The memory device 2 is preferably a known large data volume memory device of randomly accessible type, such as a hard disc device, an IC (Integrated Circuit) memory, a magnetic disc device, an optical disc device or the like.

As shown in FIG. 2, in the memory device 2, a plurality of frame definition files 21 are logically constructed. Each of the frame definition files 21 stores frame definition data. The frame definition data define a frame of a schedule table, in which medical care actions of various types (e.g. a test, a treatment, an injection, an examination, an evaluation, a medication) are arranged for each of predetermined categories and for at least each date (or a time unit shorter than date such as an hour, a minute) related to the performance of respective one of the medical care actions. Further, in each of the frame definition files 21, a plurality of cell definition files 22 are logically constructed. Each of the cell definition files 22 stores cell definition data, for each of the cells, which are constructed as the schedule table is divided by the frame into the cells. The cell definition data include: positional data indicating a line and a column of each cell; a medical care category code corresponding to each cell among a plurality of medical category codes assigned to a plurality of medical care actions of various types respectively in advance; and text data indicating text to be displayed within each cell. Furthermore, in the memory device 2, a master file 23 is logically constructed. The master file 23 stores medical care action appellation data, which indicate each appellation (name) of the medical care actions corresponding to the plurality of medical category codes, in association with each of the medical category codes.

Here, the "frame definition data" are more concretely data, which are required to define the frame such as a size

of the frame, an item name of the frame, a font for use in the display, a size of the font, text data indicating a text of comment and so on.

In the present embodiment, especially, a frame title data indicating a peculiar frame title is appended to each of the frame definition files 21, at a header portion of the frame definition file 21 for example. Here, as "the frame title", a title is preferable which indicates that the pertinent frame is suitable for a specific disease, such as "schedule table for cancer", "schedule table for Alzheimer's disease" and so on, and which is appended with the explanation for the specific disease. The input device 3, which functions as a frame selection means as described later, is adapted to select the frame definition file 21 having a desired frame title by searching the frame title data. Therefore, at the time of newly constituting a medical care schedule table for example, the frame definition file 21 having a desired frame title can be searched and selected from among a plurality of frame definition files 21, by the control device 4 in response to the operation by the doctor, the nurse or the like.

The input device 3 is, as described later in detail, adapted to append patient identification data, which indicate an arbitrary one of the patients among a plurality of patients, to the frame definition file 21, at the header portion of the frame definition file 21 for example. Then, by searching the patient identification data appended in this way, the frame definition file 21 as for the desired patient can be selected. Thus, as the patient identification data indicating the arbitrary one of the patients is appended to the frame definition file 21 related to the table displayed on the display device 5 according to the operation of the medical doctor, nurse etc., the frame definition file 21 as for the desired patient can be searched and selected from among a plurality of frame definition files 21 at the time of referring to or re-writing the medical care schedule table for the pertinent patient.

The "cell definition data" are defined here as the data, which are necessary to define the content to be displayed within each cell, including the positional data indicating the line and column of each cell, the medical care category code corresponding to each cell, the text data indicating the comment in text to be displayed within each cell, the rule data to rule or prescribe how to display the text data within each cell and so on.

The "medical care category code" is defined as a code uniquely set to each of medical care actions, and is a binary computer code for example. This code is determined in such a manner that, in case of the computer code of "0110100" for example, the upper 3 digits "011" represents an "injection" as a large category of the medical care action, and the lower 4 digits "0100" represents a "continuous infusion (drip)" as a concrete medical care action among this large category "injection". More concretely, a so-called "Rece (medical Reward Invoice)-Computer Code", which has been recently introduced in Japan and which is set for each of all items chargeable by the medical care insurance, can be utilized as this medical care category code.

In FIG. 2, the master file 23 stores a plurality of medical care action appellation data, each indicating the appellation (name) of respective one of medical care actions corresponding to a plurality of medical care category codes, in association with each of the medical care category codes. Therefore, in order to display the schedule table, the medical care category code in the cell definition file 22 can be easily and promptly developed to the corresponding medical care action appellation data, by referring to the master file 23. On the contrary to this, in case that the medical care action

appellation data is changed on the schedule table, after the medical care action appellation data is converted to the corresponding medical care category code, the medical care action appellation data after the conversion can be stored into the cell definition file 22.

In addition, the medical care action indicated by the medical care category code stored in the cell definition file 22 includes the medical care actions which have been already performed in the past and the medical care actions which are scheduled to be performed in the future. A result flag indicating whether each of the medical care actions has been already performed or not is appended to respective one of the medical care category codes. Further, detail medical care data, which accompany each medical care action indicated by respective one of the medical care category codes, are also stored in the cell definition file 22. Here, the "detail medical care data" is defined as numerical data related to each predetermined type of medical care action, such as the body temperature data, the blood pressure data, the concentration data of predetermined component in the blood and so on, which are measured every day for example.

In FIG. 3, the input device 3 is provided with an input operation device 3a such as a key board, a ten key switch, a mouse, a track ball, an input pen, an input tablet or the like, and is adapted to specify an arbitrary position on the image displayed on the display device 5. Namely, the input operation device 3a is adapted to select an arbitrary one of the frame definition files 21, and also select an arbitrary one of the cells constituting the schedule table, which is displayed on the display device 5. Such a selection of the frame definition file 21 is preferably performed by displaying a menu of the frame titles of the frame definition files 21 on the picture plane of the display device 5 and then selecting one of the displayed frame titles in the menu, by an operation of specifying the position on the menu by use of the mouse or by an operation of specifying the number on the menu by use of the key board. Further, such a selection of the cell is preferably performed by selecting one of the cells in the displayed table on the picture plane of the display device 5, by an operation of specifying the position of the cell by use of the mouse or by an operation of specifying the number of the cell by use of the key board. The input operation device 3a is adapted to newly input, add, change, modify or delete the cell content display data on the picture plane of the display device 5 as for the selected cell. In the present embodiment, especially, when the detail medical care data obtained as the result of the medical care action is inputted, the result flag, which indicates that the pertinent medical care action has been already performed, is set with respect to the medical care category code in the cell definition file 22. In the present embodiment especially, when the detail medical data, which have been obtained as a result of the medical care action, are inputted, the result flag is set ON which indicates the fact that the pertinent medical care action has been performed.

In FIG. 3, in addition to the input operation device 3a, the input device 3 is also provided with a reading out device 3b for reading out the patient identification data from a record medium to which the patient identification data are recorded. As the record medium in this case, a card type medium, on which the patient identification data are electrically, magneto-electrically, magneto-optically or optically recorded such as a magnetic card, an IC card, etc., is convenient. As the reading out device 3b, a device for electrically, magneto-electrically, magnetically, magneto-optically or optically reproducing the data in correspondence with the type of record medium is utilized. The input device

3 is further provided with a reading out device 3c for reading out the cell definition data from a record medium to which the cell definition data are recorded. In this case, as the record medium in this case, a known large data volume type record medium to which the cell category data indicating the medical care actions for each patient, each date and each type of actions for example, are electrically, magneto-electrically, magnetically, magneto-optically or optically recorded such as a magnetic disc, a magneto-optical disc, an optical disc, a ROM, an IC card, a magnetic tape, etc., may be utilized. As the reading out device 3c, a device for reading the record medium electrically, magneto-electrically, magnetically, magneto-optically or optically in correspondence with the kind of record medium is utilized.

The medical care navigation system 1 is also provided with a record medium reading device 8 such as an optical disk driver device, a floppy or flexible disk driver device and so on, and a record medium 9 readable by the record medium reading device 8, such as an optical disk, a floppy or flexible disk and so on. The record medium 9 as one example of a program storage device, tangibly embodies a program of instructions executable by the medical care navigation system 1 to perform method steps for aiding a preparation of medical care schedule and record. The program read by the record medium reading device 8 may be stored in the memory device 2, so as to speedily execute the program.

In FIG. 1 again, the control device 4 having a CPU (Central Processing Unit) is provided with a display data generation control device 4a for: generating frame display data to display a frame on the basis of the frame definition data stored in the frame definition file 21 which is selected by the input device 3; specifying each cell corresponding to respective one of the cell definition files 22 on the basis of the positional data in the cell definition data stored in the cell definition files 22 provided for the selected cell definition file 21; developing the medical care category code in the stored cell definition data 22 to the corresponding medical care action appellation data with referring to the master file 23; and generating the cell content display data to be displayed in each of the specified cells on the basis of the developed medical care action appellation data and the text data. Further, the control device 4 is provided with a stored data update control device 4b for updating the cell definition file 22 specified on the basis of the positional data of the cell selected by the input device 3 in correspondence with the cell content display data, which has been newly inputted, added, changed, modified or deleted, when the cell content display data is newly inputted, added, changed, modified or deleted by the input device 3.

The display data generation control device 4a is preferably constructed to control the display device 5 to perform the menu-display of candidacies to be newly inputted, candidacies to be added and candidacies to be changed or modified, when the cell is selected by the position specifying operation by use of the mouse etc. of the input operation device 3a. And that, the input operation device 3a is preferably constructed to newly input, add, change or modify according to the data in the displayed menu. In this case, as the menu-display, a list of the medical care actions each of which has a possibility to be newly inputted, added, changed or modified in accordance with the category of the medical care action corresponding to the pertinent cell, for example.

Alternatively or additionally, the medical care navigation system 1 may be constructed such that the medical care category code or the text data are inputted through the input operation device 3a etc., without the above mentioned menu-display. Here, especially in case of inputting the

medical care action appellation by the text, the inputted text data (i.e. the medical care action appellation data) are converted to the medical care category code with referring to the master file 23 as aforementioned, so as to update it.

Further, especially in the present embodiment, it is preferable that the frame definition data as for the displayed table on the display device 5 can be changed by the input operation device 3a. In this case, the display data generation control device 4a constitutes at least one portion of the display data to be displayed in each cell of the table by a font or fonts, and sets the size of the font to be harmonized with the size of each cell which is determined according to the frame defined by the frame definition data changed by the input operation device 3a. Therefore, even if the frame is changed to one favorite for the user, the font harmonized with the displayed cell (frame) is appropriately displayed in the table, so that it is possible to prevent the font from being out of the cell and prevent the unnecessary space from being generated in the cell.

In the present embodiment, the medical care category code in the cell definition data is the computer code which indicates each item chargeable by the medical care insurance. Each time when the medical care category code is newly inputted, added, changed or deleted by the input device 3, the control device 4 calculates the medical care insurance point for each cell by a predetermined equation expressed by the rule data, which rules or prescribes the predetermined equation in advance, on the basis of the medical care category code newly inputted, added, changed, modified or deleted by the input device 3. The cell definition file 22 is constructed to further store the medical care insurance point data. On the other hand, the display data generation control device 4a controls the display device 5 to display the medical care insurance point data calculated in this manner as one portion of the cell content display data. Therefore, according to the present embodiment, by the manual operation of the operator such as the doctor, the nurse, etc., each time when the medical care category code is newly inputted, added, changed, modified or deleted, the updated medical care insurance point is automatically displayed and stored into the cell definition file 22, which is very convenient.

In FIG. 1 again, the display device 5 may be a known display device such as a CRT (Cathode Ray Tube) display device, an LCD (Liquid Crystal Display) device or the like, and is especially constructed such that an arbitrary position on its picture plane can be specified by the input device 3.

The printer 6 may be a known printer such as a laser beam printer, an ink jet printer or the like, and may be a color type or a black and white type.

The communication device 7 is constructed to perform a data communication with another medical care navigation system or the like through a telephone line, an exclusive communication line or the like. It is convenient that the frame definition file 21 or the cell definition file 22 can be shared or can be transmitted and received with respect to another medical care navigation system by use of the communication device 7. Incidentally, this kind of data sharing can be also enabled by once storing the frame definition file 21 or the cell definition file 22 stored in the memory device 2 into the floppy disk or the like, and carrying it between a plurality of medical care navigation systems.

By the medical care navigation system 1 constructed in the above explained manner, a table 10 is displayed on the picture plane of the display device 5 as shown in FIG. 4 for example.

In FIG. 4, the table 10 has a plurality of lines (horizontal rows) 11, which are divided into each type of medical care actions, and a plurality of columns (vertical rows) 12, which are divided into each date. The medical care actions of various types consisting each line 11, may be the record by the doctor or nurse, the process, the injection, the examination, the test, the evaluation, the medication, the meal (food), the practice, the monitor, the treatment, the activity restriction, the observation, the rehabilitation, the coordination, the hospitalization and the leave of hospital, the education for the family of the patient and so on. As for those items of medical care activities, an arbitrary item can be set depending upon the usage condition of the medical care navigation system 1. Since various formats each of which has a possibility to be used are stored in the frame definition file 22 shown in FIG. 2 in advance, the desired one of the formats can be selected by the input operation device 3a, which is very convenient. This selection of the format may be performed by displaying a menu for format selection on the display device 5. In this case, in addition to the medical care category code indicating each medical care action, the medical care action may be displayed on the basis of the text data in which each medical care action is expressed by the text in certain language. Especially, the cell definition data indicating the record of the doctor or nurse (i.e. the comment data) may include the text data indicating the pathobiology of the patient by the text, or the code data indicating the pathobiology of the patient by the specific code according to the predetermined rule, and further, the data in which the medical care results are expressed by the text or code data.

As shown in FIG. 4, the record of the doctor and the record of the nurse, which are recorded conventionally on different ledgers, can be displayed or printed on the same display picture plane or the same printed sheet, so that the canalization of the intentions and the team work between the doctor and the nurse can be promoted.

In the present embodiment, although the detail medical data indicating the detail record related to the medical care action of "record" in the table of FIG. 4 are not seen on the table, the detail medical data are stored in the cell definition file 22 in a form of hanging from each cell definition data in the logical data structure. For example, by clicking the mouse of the input operation device 3a of FIG. 3 on the picture plane of the display device 5 at a display position in a certain frame of the table of FIG. 4, the detail medical data corresponding to the item in the frame are displayed in the format different from this. Then, a time stamp is stamped to the medical care data and its accompanied detail medical data related to the "record" in the record of FIG. 4 each time when recording is performed by the doctor or the nurse. Namely, the date and the time of recording are recorded as the detail medical data. Thus, the doctor and the nurse can share the information in a conversation manner by use of the table.

The input operation device 3a is adapted to newly input, add, change, modify and delete the output data in each frame of the table 10 when the table 10 is displayed on the display device 5. The stored data content of the cell definition file 22 is adapted by the new cell definition data and its accompanied detail medical data under the control of the stored data update control device 4b. Because of the construction as described above, a table, which has a framework as shown in FIG. 4 and which major frames are originally blanked or which include only the medical care data indicating one standard medical care schedule initialized as the default values according to the predetermined standard, is firstly

displayed on the display device 5. After that, the doctor in charge etc. can newly input the data manually by use of the input operation device 3a of FIG. 3, and can add, change, modify or delete the data manually by use of the input operation device 3a of FIG. 3, so as to make the medical care record and schedule one item by one item, which is very convenient. Further, the medical care data displayed on the table 10 can be wholly or partially replaced by the medical care data stored in the floppy disk etc. and read out by the reading out device 3c of FIG. 3, which indicate the medical care schedule appropriately applied to the patient in the past.

The medical care navigation system 1 may be provided with a timer or counter for counting the date, and the display data may be generated such that the graphically outputted portion related to the date coincident with "today" is displayed in a manner different from the other graphically outputted portion, on the basis of the date counted by the timer or counter. Here, as the display and/or print in a different manner, there are display methods of displaying or printing the image different in the brightness, the color, the style, the kind of lines, the concentration, the half-tone dot meshing etc. on the picture plane or the printed sheet.

In the present embodiment, the input operation device 3a is adapted to specify at least one cell displayed in the table (e.g. at least one of an arbitrary data and an arbitrary type in the dates and the types of actions in the table displayed on the display device 5) as the object of display. The display data generation control device 4a is adapted to generate the display data for displaying the cell definition data and its accompanied detail medical data, which are related to this specified one of the date and/or type, in the format different from that of the table, on the picture plane of the display device 5. Namely, the display data generation control device 4a is constructed to generate the display data for displaying only some portion of the medical care category data and its accompanied detail medical data, which are related to the specified data and/or type among the dates and types in the table, fully on the picture plane in a list format as shown in FIG. 5 or in a magnified manner.

The switching operation from the display of the table in FIG. 4 to the display of the list in FIG. 5 can be performed when the mouse is clicked after the cursor is moved to a desirable item (e.g. frame) in the table 10 of FIG. 4 by use of the input operation device 3a of FIG. 3. Namely, by use of the detail medical data related to the medical care category data corresponding to a desired item where the cursor is positioned on the display picture plane of FIG. 4, the list of FIG. 5 is displayed. In this case, the list of FIG. 5 may be displayed by opening a window on the table of FIG. 4. Alternatively, by omitting the display of the table shown in FIG. 4, the detail medical data display as shown in FIG. 5 or the magnified display may be directly performed.

The input operation device 3a is constructed to change the frame definition data e.g., specify the number of dates to be included in one table by the display device 5, for example. The display data generation control device 4b is constructed to make at least one portion of the display data, which fills one frame of the table by the font, and to set the size of the font in harmonization with the size of each frame in the table, which is determined according to the dates specified by the input operation device 3a. Namely, for example, if 14 days are specified as the dates included in one table such as "July 1<sup>st</sup> to July 14<sup>th</sup>", the font size corresponding to this relatively small size of the frame is used to generate the display data. On the other hand, if 3 days are specified as the dates included in one table such as "July 1<sup>st</sup> to July 3<sup>rd</sup>", since the frame size is rather large, the font size corresponding to this relatively large size is used to generate the display data.

In the present embodiment, the result flag is appended to the medical care category data, which indicates whether or not the medical care action indicated by the medical care category data has been already performed. The display data generation control device 4a is constructed to generate the display data such that the graphically displayed portion corresponding to the medical care action, which has been already performed, and the graphically displayed portion corresponding to the medical care action, which has not been performed yet, are displayed in a manner different from each other on the basis of the result flag. For example, the action which has not been performed yet may be displayed by use of blue colored characters, while the action which has already been performed may be displayed by use of black colored characters. Further, the medical care category data, which can be displayed in a special format different from that of the table e.g. the medical care category data which accompanies the numerical data such as the body temperature data, the blood constituent data or the like as the detail medical data, may be outputted by use of red colored characters. Other than the color, the brightness, the styles, the kind of lines, the concentration, the half tone meshing etc. may be changed on the displayed image. In this manner, by changing the display manner in accordance with the result flag, it is easy for the operator to recognize at a moment notice whether or not there exists the detail medical data as for each medical care action and whether or not the item in the table is actually completed or is in the stage of planning, which is very convenient.

FIG. 6 shows another example of the table which can be outputted by the display device 5 and the printer 6 in the present embodiment. In this case, the memory device 2 stores at least some portion of the cell definition data with respect to each time of the day in addition to the date. The display data generation control device 4a is constructed to generate the display data for graphically outputting each medical care action in the order of time of the day in each frame of the table as for at least some portion of the medical care action appellation data. Corresponding to this, the display device 5 and the printer 6 output the table 20 in which the content of each frame 21 forms a list for each time of the day as shown in FIG. 6. By this, since the medical care actions are arranged in each frame of the table in the order of time of the day, it is easy for the operator to visually recognize the medical care actions performed in one day. This is especially convenient in a case where many medical care actions to be scheduled and recorded exist in one day such as the day in the hospitalization.

FIG. 7 shows another example of the table which can be outputted by the display device 5 and the printer 6 in the present embodiment. In this case, the memory device 2 is constructed to store at least some portion of the cell definition data with respect to each time of the day in addition to the date. The display data generation control device 4a is constructed to generate the display data for graphically outputting each medical care action in a table, which columns are finely divided by a predetermined time unit instead of just date (see FIGS. 4 and 6) in the table as for at least some portion of the medical care action appellation data. Corresponding to this, the display device 5 and the printer 6 output the table 30, in which the medical care actions in each 6 hours are put in one frame of the table and the columns are arranged every 6 hours as shown in FIG. 7. By this, if it is the case where a lot of medical care actions are to be recorded or scheduled such as the day in the hospitalization, a fine schedule for each time can be scheduled and recorded. Other than 6 hours, although a unit such

as 1, 2, 3, 4, 8 or 12 hours which can easily divide 24 hours (one day) can be preferably used here, an arbitrary time unit can be used such that a time unit of long time length may be used with respect to the day time while a time unit of short time length may be used with respect to the night time. By graphically outputting the table 30 having the arrangement in the time unit, it is easy for the operator to visually recognize the medical care actions performed in one day.

FIG. 8 shows another example of the table which can be outputted by the display device 5 and the printer 6 in the present embodiment. In this case, the display data generation control device 4a is constructed to generate the display data for graphically outputting in a format of a table in which the medical care action appellation data are integrated by a unit of a plurality of successive dates for at least some portion of the medical care action appellation data. Corresponding to this, the display device 5 and the printer 6 output the table 40 in which the medical care actions in each one month period are put in one frame 41 of the table and the columns are arranged ever month as shown in FIG. 8. Other than one month, although a time unit such as 3 days, one week, one year or 10 years which are easily understood, can be preferably used here, an arbitrary time unit can be used such that a short time length may be used for the time unit with respect to the period of the hospitalization while a long time length may be used for the time unit with respect to the period for the outpatient. By generating the cell definition data in correspondence with the amount of the frequency of the medical care actions, it is easy for the operator to visually recognize the aspect of the medical care actions in a long time span.

FIG. 9 shows another example of the table which can be outputted by the display device 5 and the printer 6 in the present embodiment. In this case, the detail medical data include the numerical data related to a certain medical care action which is repeatedly recorded with respect to a plurality of dates (e.g. the body temperature, the blood pressure, the specific content concentration in the blood). The display data generation control device 4a is adapted to generate the display data for graphically outputting the table 52 at one portion of the picture plane 51 of the display device 5 and at the same time graphically outputting the numerical data as a graph having the abscissa corresponding to the arrangement of the dates of the table 52 at another portion of the picture plane 51. As a result, as shown in FIG. 9, the table 52 is displayed at the lower portion of the display picture plane 51. A polygonal line graph 53 indicating the numerical data as for the A item (e.g. the body temperature) and the polygonal line graph 54 indicating the numerical data as for the B item (e.g. blood pressure), each of which have the time axis of the date of the table 52, are displayed in the upper margin of the table 52. Accordingly, since the numerical data can be shown as the graph in correspondence with the date of the table 52, it is easy for the operator to visually recognize the relationship between the medical care actions which have been performed in the past and the numerical data which indicate the body condition etc. of the patient to which the medical care actions were applied. As shown in the example of FIG. 9, if there are several data obtained by the measurements several times in one day, by drawing the graph such that the width of each frame of the table 52, which expresses one day, is converted to 24 hours, and that the upper line of the table 52 is made corresponding to the time axis of the graph, the time relationship between the numerical data and the table 52 can be still easily recognized. On the other hand, even if the numerical data do not always exist for every date, it is still possible to draw the



polygonal line graph by use of the existing data and/or by interpolating the existing data.

The format information indicating the display formats of the tables such as the tables shown in FIGS. 4 to 9 as explained above, are stored in the memory device 2 in advance, so that desirable one of them can be selected by use of the menu picture plane for selecting the format, for example.

Nextly, the operation of the present embodiment will be explained in detail. The operation explained hereinbelow is performed by the medical care navigation system 1, in accordance with the program of instructions to perform the method steps for aiding the preparation of medical care schedule and record, which is recorded on the record medium 9 and is read by the record medium reading device 8. The read program may be stored in the memory device 2.

First of all, the operation for referring to the table is explained.

When the referring operation is started, in the medical care navigation system 1, it is checked by the stored data update control device 4b whether or not there is the input of the patient identification data from the input device 3. Then there is the input from the input device 3, the frame definition file 21 corresponding to the inputted patient identification data is selected from the memory device 2. Nextly, by the display data generation control device 4a, the frame display data to display the frame are generated on the basis of the frame definition data selected in this way. Along with this, each cell corresponding to respective one of the cell definition files 22 is specified on the basis of the positional data in the cell definition data stored in the cell definition files constructed with respect to the selected frame definition file 21. Then, the medical care category code in the pertinent cell definition data is developed to the corresponding medical care action appellation data with referring to the master file 23. Then, on the basis of the developed medical care action appellation data and the text data, the cell content display data to be displayed in each of the specified cell is generated. Then, the table shown in each of FIGS. 4 to 9 for example, is displayed, on the basis of the generated frame display data and the cell content display data by the display device 5, and the referring process is ended.

Nextly, the operation for inputting (e.g., newly inputting, adding, changing, modifying or deleting) the medical care data is explained.

When the inputting operation is started, it is checked by the stored data update control device 4b whether or not there is the input of the cell definition data and its accompanied detail medical data from the input device 3. Here, one of the cells constituting the displayed schedule table is selected by the inputting operation of the operator such as the doctor, the nurse, etc., and the cell content display data as for this selected cell is newly inputted, added, changed, modified or deleted on the display device 5 through the input operation device 3a. Then, the stored content of the cell definition file 22 specified on the basis of the positional data of the selected cell is updated by the stored data update control device 4b in correspondence with the cell content display data which have been newly inputted, added, changed, modified or deleted. Then, the input process is ended.

In the above explained embodiment, the input device 3 may be constructed to input operator identification data for identifying an operator as well as the patient identification data. In this case, the stored data update control device 4b is constructed to select only the cell definition data, which

indicate the medical care action of the type set in advance as the type able to be referred to by the respective operator indicated by the inputted operator identification data, from the cell definition file 22. For example, in the memory device 2, there is stored an operator table, which indicates whether or not each of the doctor, the trainee doctor, the trainee medical student, the nurse, the semi-nurse, the cook, the driver and so on is allowed to refer to the medical care data in each type of actions, so that the medical care data in the type of action able to be referred to by the pertinent operator indicated by the received operator identification data can be speedily extracted by checking this operator table.

By this construction, only the medical care data and its accompanied detail medical data, which belong to the range specified as the range able to be referred to depending on the operator category in advance, can be actually referred to, the leakage of the secret information or the infringement of the patient privacy can be efficiently prevented. In this case, the operator identification data may be inputted from the input operation device 3a, the patient identification data and the operator identification data may be inputted through the input operation device 3a, the operator identification data may be inputted through the reading out device 3b, or the patient identification data and the operator identification data through the reading device 3b.

The medical care navigation system 1 may be connected with a plurality of other medical care navigation systems of the same type through a communication line. In this construction, the medical care data can be shared or commonly used by the medical care navigation systems. In order to make all of the medical care data coincident to each other in all of the memory devices in the medical care navigation systems, each time when the new medical care data are inputted at each of the medical care navigation systems, or each time when the data are added, changed, modified and deleted, the new medical care data are transmitted and received by the communication device 7 in each of the medical care navigation systems, so that the stored content of each memory device 2 are updated by the received medical care data. Alternatively, the stored content of each memory device 2 may be unified to the new medical care data periodically e.g. at a time of opening or closing the work ever day, or may be unified to the medical care data inputted at one medical care navigation system 1, which is predetermined to have the priority.

Finally, the functions of the medical care navigation system 1 used in the above described embodiment are conceptually indicated in FIG. 10.

In FIG. 10, the function of the medical care navigation system 1 unifies: a function of "operation on the picture plane" 13 realized by the display device 5, the input device 3 etc. shown in FIG. 1; a function of "display" 14 realized by the display device 5 etc., a function of "various system interface" 15 realized by the communication device 7, the control device 4 etc. The function of "operation on the picture plane" 13 unifies a function of "new input" 13a, a function of "add/modify input" 13b and a function of "delete" 13c. The function of "display" 14 unifies a function of "displaying the table" 14a by use of the medical care data, a function of "displaying the result" 14b by use of the medical care data and/or the detail medical data, a function of "displaying the graph" 14c for displaying the graph by use of the detail medical data, and a function of "magnification change" 14d for changing the magnification of picture plane of the display device 5.

Further, the function of "various system interfaces" 15 unifies a function of "various order" 15a for sending an

order between each medical care navigation units, a function of "electronic clinical chart" 15b used by the operation unit for medical examination, and a function of "medical account" 15c used by the operation unit for account.

In this manner, since the functions are unified in the multiple layered structure, each function can be efficiently called and mutual functions organically combined to each other can be performed by the medical care navigation system 1, which is convenient.

As described above in detail, according to the present embodiments, since all of the staffs in the hospital can simultaneously see the same table, they can share the information as for the condition of the patient. Further, it is possible for each staff to suitably add, modify, change and delete the medical care schedule while watching the table, and suitably input the result data indicating the result of the medical care actions performed in accordance with the table while watching the table. Therefore, the medical care schedule which is the most suitable for each patient can be accumulated to be constructed in the memory device by the continuous data input operations of each staff i.e. by the team work of the whole staffs in the hospital, while adding some suitable adjustment toward the medical care object such as the cure of the sickness or disease. The medical care data and its accompanied detail medical data, which construct the medical care schedule scheduled in this manner, can be reserved as the record in the strict standard format.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiments are therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

What is claimed is:

1. A medical care schedule and record aiding system comprising:

- a plurality of frame definition files each storing frame definition data to define a frame of a table, in which medical care actions of various types are arranged in first rows for each type of the medical care actions and in second rows orthogonal to said first rows for each date;
- a plurality of cell definition files, which are set for each of the frame definition files, and each of which stores cell definition data including at least positional data, which indicates a first row and a second row of each of cells segmented by the frame of the table, among (i) the positional data, (ii) a medical care category code, which corresponds to said each of cells from among a plurality of medical care category codes respectively assigned to the medical care actions of various types in advance, and (iii) text data indicating a text to be displayed in said each of cells;
- a master file for storing a plurality of medical care action appellation data, each of which indicates an appellation of a medical care action corresponding to respective one of the medical care category codes, in association with each of the medical care category codes;
- a frame selection means for selecting an arbitrary one of said frame definition files;
- a display data generation means for (i) generating frame display data to display the frame of the table on the basis of the frame definition data stored in said selected

frame definition file, (ii) specifying each cell corresponding to respective one of said cell definition files on the basis of the positional data in said cell definition data stored in each of said cell definition files set for said selected frame definition file, (iii) developing the medical care category code, which is included in the stored cell definition data, to the medical care action appellation data, which correspond to the medical care category code to be developed, with referring to said master file, and (iv) generating cell content display data to be displayed in said specified each cell on the basis of the developed medical care action appellation data and the text data;

a display device for displaying the table on the basis of the generated frame display data and the generated cell content display data;

a cell selection device for selecting an arbitrary one of the cells constructing the displayed table;

an input device for newly inputting, adding, changing, modifying or deleting the cell content display data on said display device as for said cell selected by said cell selection device; and

an update device for updating said cell definition file specified on the basis of the positional data of the selected cell, when the cell content display data is newly inputted, added, changed, modified or deleted by said input device, in correspondence with the newly inputted, added, changed, modified or deleted cell content display data.

2. A system according to claim 1, wherein

frame title data indicating a unique title is appended to each of said frame definition files, and

said frame selection device selects one of said frame definition files, which has a desired frame title, by searching the frame title data.

3. A system according to claim 1, wherein

said input device is constructed to append patient identification data, which indicate arbitrary one of a plurality of patients, to said frame definition file selected by said frame selection device, and

said frame selection device selects one of said frame definition files for a desired patient by searching the patient identification data.

4. A system according to claim 1, wherein

said display data generation device generates menu display data to display a menu of candidacies for newly inputting, adding, changing or modifying the cell content display data when the cell is selected by said cell selection device, and

said input device is constructed to newly input, add, modify or change the cell content display data on the menu based on the generated menu display data and displayed on said display device.

5. A system according to claim 1, wherein

the medical care category code comprises a computer code indicating each item chargeable by a medical insurance,

said system further comprises a calculation device for calculating a medical care insurance point for said each cell on the basis of the medical care category code, which has been newly inputted, added, changed, modified or deleted, each time when the medical care category code is newly inputted, added, changed, modified or deleted by said input device, and to output medical care insurance point data,



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said cell definition file stores the cell definition data further including the medical care insurance point data, and

said display data generation device generates the cell content display data on the basis of the medical care insurance point data in addition to the developed medical care action appellation data and the text data.

6. A system according to claim 1, wherein said input device is constructed to specify at least one of the cells in the displayed table as a display object, and said display data generation device generates display data to display the cell definition data, which are related to the cell specified as the display object, in a format different from the table.

7. A system according to claim 1, wherein said input device is constructed to change the frame definition data as for said frame definition file selected by said frame selection device, and said display data generation device makes from a font at least one portion of display data for filling each of the cells in the table while setting a size of the font in harmonization with the size of each cell determined by the frame defined by the frame definition data, which has been changed by said input device.

8. A system according to claim 1, wherein said system further comprises a counter for counting the date, and said display data generation device generates at least one of the cell content display data and the frame display data such that one portion of graphical output related to the date corresponding to a present day is displayed in a display manner different from that of the other portion of graphical output, on the basis of the date counted by said counter.

9. A system according to claim 1, wherein a result flag, which indicates whether or not the medical care action indicated by each of the medical care category codes has been already performed, is appended to said each of the medical care category codes, and said display data generation device generates at least one of the cell content display data and the frame display data such that one portion of graphical output related to the medical care action which has been already performed is displayed in a display manner different from that of another portion of graphical output related to the medical care action which has not been performed yet, on the basis of the result flag.

10. A system according to claim 1, wherein at least some of the medical care category codes are appended with time data indicating time of the day in addition to the date, and said display data generation device generates the cell content display data such that said at least some of the medical care category codes are arranged per each time of the day in each cell of the table, on the basis of the time data.

11. A system according to claim 1, wherein said cell definition data further include detail medical care data related to the medical care action indicated by respective one of the medical category codes, said input device is constructed to specify a desirable medical care action appellation among from the medical care action appellations displayed in the table by said display device,

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said display data generation device further generates display data to display the detail medical care data related to the medical care action appellation, which has been specified by said input device, in a predetermined format different from the table, on the basis of the detail medical care data, and

said display device displays the generated display data in the format different from the table.

12. A system according to claim 11, wherein the detail medical care data include numerical data, which are related to a predetermined type of the medical care action, which is indicated by the respective one of the medical care category codes, and are recorded with respect to a plurality of dates, said display data generation device generates one display data to graphically output the table at one portion of an output image and generates another display data to graphically output the numerical data as a graph having a time axis corresponding to an arrangement of the dates of the table at another portion of the output image on the basis of the numerical data, and said display device displays the generated one and another display data.

13. A system according to claim 1, further comprising a communication device connectable to another medical care schedule and record aiding system through a predetermined communication path, for transmitting and receiving at least the cell definition data.

14. A medical care schedule and record aiding method in a medical care schedule and record aiding system, said system comprising: a plurality of frame definition files each storing frame definition data to define a frame of a table, in which medical care actions of various types are arranged in first rows for each type of the medical care actions and in second rows orthogonal to said first rows for each date; a plurality of cell definition files, which are set for each of the frame definition files, and each of which stores cell definition data including at least positional data, which indicates a first row and a second row of each of cells segmented by the frame of the table, among (i) the positional data, (ii) a medical care category code, which corresponds to said each of cells from among a plurality of medical care category codes respectively assigned to the medical care actions of various types in advance, and (iii) text data indicating a text to be displayed in said each of cells; and a master file for storing a plurality of medical care action appellation data, each of which indicates an appellation of a medical care action corresponding to respective one of the medical care category codes, in association with each of the medical care category codes,

said method comprising the processes of:

- a frame selection process of selecting an arbitrary one of said frame definition files;
- a display data generation process of (i) generating frame display data to display the frame of the table on the basis of the frame definition data stored in said selected frame definition file, (ii) specifying each cell corresponding to respective one of said cell definition files on the basis of the positional data in said cell definition data stored in each of said cell definition files set for said selected frame definition file, (iii) developing the medical care category code, which is included in the stored cell definition data, to the medical care action appellation data, which correspond to the medical care category code to be developed, with referring to said master file, and (iv)

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generating cell content display data to be displayed in said specified each cell on the basis of the developed medical care action appellation data and the text data;

- a display process of displaying the table on a display device on the basis of the generated frame display data and the generated cell content display data;
- a cell selection process of selecting an arbitrary one of the cells constructing the displayed table;
- an input process of newly inputting, adding, changing, modifying or deleting the cell content display data on said display device as for said cell selected by said cell selection process; and
- an update process of updating said cell definition file specified on the basis of the positional data of the selected cell, when the cell content display data is newly inputted, added, changed, modified or deleted by said input process, in correspondence with the newly inputted, added, changed, modified or deleted cell content display data.

15. A program storage device readable by a medical care schedule and record aiding system, tangibly embodying a program of instructions executable by said medical care schedule and record aiding system to perform method processes for aiding a preparation of medical care schedule and record, said system comprising: a plurality of frame definition files each storing frame definition data to define a frame of a table, in which medical care actions of various types are arranged in first rows for each type of the medical care actions and in second rows orthogonal to said first rows for each date; a plurality of cell definition files, which are set for each of the frame definition files, and each of which stores cell definition data including at least positional data, which indicates a first row and a second row of each of cells segmented by the frame of the table, among (i) the positional data, (ii) a medical care category code, which corresponds to said each of cells from among a plurality of medical care category codes respectively assigned to the medical care actions of various types in advance, and (iii) text data indicating a text to be displayed in said each of cells; and a master file for storing a plurality of medical care action appellation data, each of which indicates an appellation of a

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medical care action corresponding to respective one of the medical care category codes, in association with each of the medical care category codes,

said method processes comprising the processes of:

- a frame selection process of selecting an arbitrary one of said frame definition files;
- a display data generation process of (i) generating frame display data to display the frame of the table on the basis of the frame definition data stored in said selected frame definition file, (ii) specifying each cell corresponding to respective one of said cell definition files on the basis of the positional data in said cell definition data stored in each of said cell definition files set for said selected frame definition file, (iii) developing the medical care category code, which is included in the stored cell definition data, to the medical care action appellation data, which correspond to the medical care category code to be developed, with referring to said master file, and (iv) generating cell content display data to be displayed in said specified each cell on the basis of the developed medical care action appellation data and the text data;
- a display process of displaying the table on a display device on the basis of the generated frame display data and the generated cell content display data;
- a cell selection process of selecting an arbitrary one of the cells constructing the displayed table;
- an input process of newly inputting, adding, changing, modifying or deleting the cell content display data on said display device as for said cell selected by said cell selection process; and
- an update process of updating said cell definition file specified on the basis of the positional data of the selected cell, when the cell content display data is newly inputted, added, changed, modified or deleted by said input process, in correspondence with the newly inputted, added, changed, modified or deleted cell content display data.

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